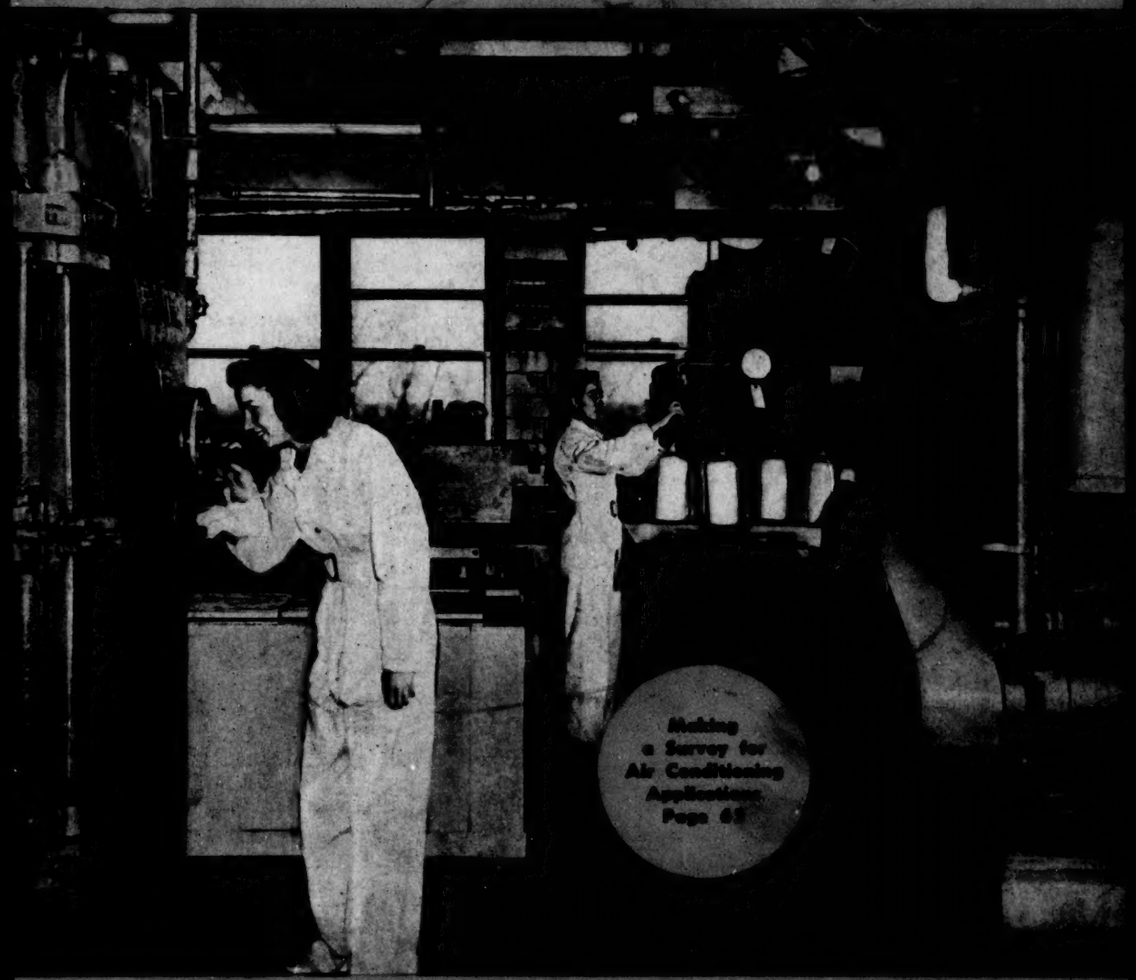
JULY, 1951

RECEIVED
AUG 2 1951
U. S. PATENT OFF.
Publishing Dept.

HEATING AND VENTILATING

INCLUDING AIR CONDITIONING – PIPING – REFRIGERATION – AIR SANITATION



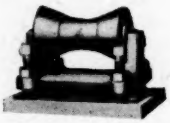
Design Effect of Antifreeze . page 61
Air Conditioning Design Data . . . . page 74
Heat Pump Water Heater . page 77
Analysis of Zone Control . page 81
Table of Contents . . . . page 3

ADJUSTABLE PIPE HANGERS AND SUPPORTS

for every piping requirement

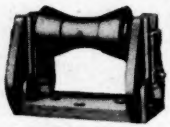
pipe rolls

Pipe Roll and Plate
Fig. 277
2 to 30 in. pipe

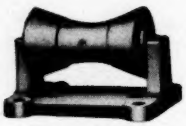


Adj. Pipe Roll with Base
Fig. 274
Without base: Fig. 275
2 to 30 in. pipe

Adj. Swivel Pipe Rol'
Fig. 174
2½ to 12 in. pipe



Adj. Pipe Roll
Fig. 276
4 to 30 in. pipe



Pipe Roll Complete
Fig. 271
2 to 30 in. pipe

Single Pipe Roll
Fig. 171
1 to 30 in. pipe

pipe saddles

Pipe Stanchion Saddle
Fig. 259
4 to 36 in. pipe

Adj. Pipe Saddle Support
Fig. 264
2½ to 36 in. pipe

Pipe Saddle Support
Fig. 258
4 to 36 in. pipe

Anchor Chair
Fig. 197
4 to 24 in. pipe

Pipe Covering Protection Saddle
Figs. 185, 186, 187, 188
Type A for 10 in. and smaller

Pipe Covering Protection Saddle
Figs. 185, 186, 187, 188
Type B for 12 in. and larger

Write for Hanger Catalog

GRINNELL

WHENEVER PIPING IS INVOLVED

Grinnell Company Inc., Providence, Rhode Island • Sales Offices and Warehouses in Principal Cities

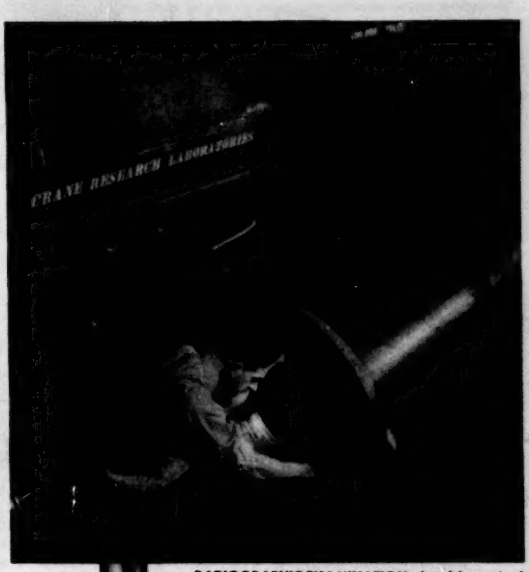
pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco humidification and cooling systems

no unit fabrication job too tough for CRANE

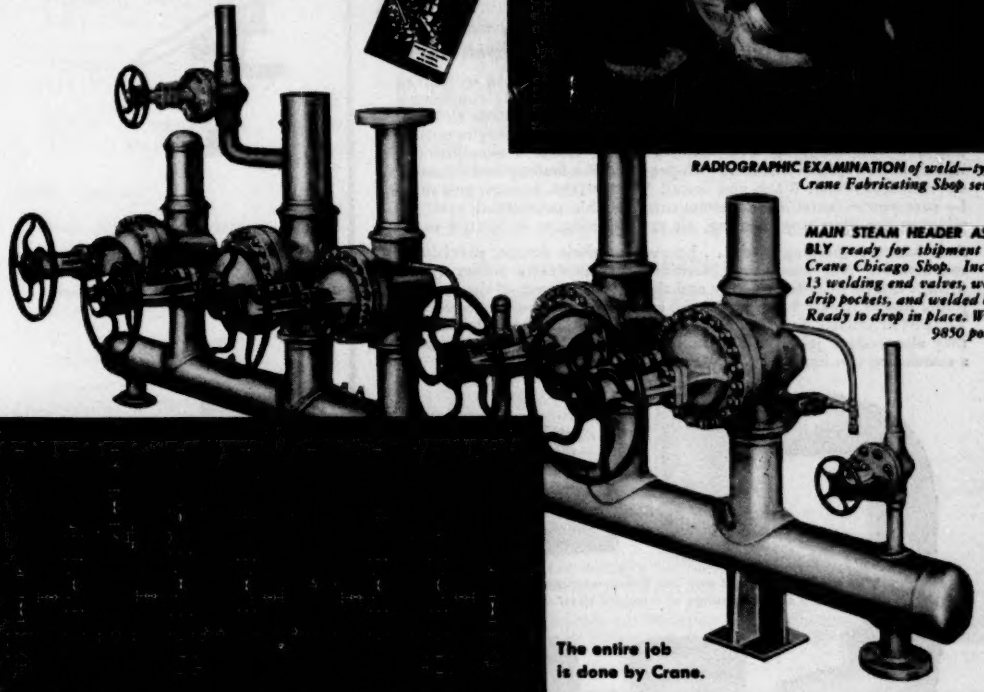
Whether your piping project calls for a simple pipe bend . . . or a complex welded assembly . . . Crane fabricating facilities can handle it. No pipe shop is better equipped to do your *entire* job from drawings of *your* design.

At Crane all steps of fabrication—such as bending, welding, stress relieving or heat-treating, radiographic examination, hydrostatic testing—are rigidly checked under procedure control to maintain adequate standards of accuracy and quality.

And because each assembly is tested as a unit, with major assemblies proved in advance of installation—you can erect your piping systems with minimum expense and delay. For further information, **ask for Folder AD-1771.**



RADIOGRAPHIC EXAMINATION *of weld—typical Crane Fabricating Shop service.*



MAIN STEAM HEADER ASSEMBLY *ready for shipment from Crane Chicago Shop. Includes 13 welding end valves, welded drip pockets, and welded bases. Ready to drop in place. Weight 9850 pounds.*

The entire job is done by Crane.

CRANE

CRANE CO., *General Offices:*
836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas

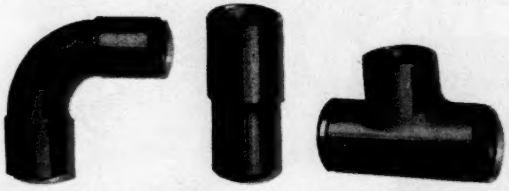
VALVES • FITTINGS • PIPE • PLUMBING • HEATING

look! ...it must be a *Streamline*® fitting!

Streamline® solder type fittings are really made to last . . . and they'll make a neater, quicker installation

If Cleopatra's plumber had used STREAMLINE fittings we wouldn't be surprised if they would still be in pretty serviceable condition today. For STREAMLINE solder type fittings are really made to last. They cannot rust, they're not loosened by vibration and they're virtually free from clogging. STREAMLINE fittings assure a snug-fitting, tightly joined system that tests leak-proof on the first try and doesn't develop leaks later. When you install STREAMLINE fittings, you can be sure you're installing a permanently reliable conducting system whether for plumbing, heating, air conditioning or industrial use.

And here's something else . . . because of their design, precision manufacture and accurate dimensions, STREAMLINE solder type fittings can be installed quickly and the uniform depth of the solder joints makes it easy to compute the exact length of tubing needed. Thus STREAMLINE fittings not only assure a permanent installation, they also reduce job cost and increase the number of installations a contractor can handle.



STREAMLINE wrought and cast fittings are available in a complete range of standard sizes.

See your jobber for further information or write for catalogs S-351 and W-251 describing our complete line of STREAMLINE wrought copper and cast bronze fittings.

65

MUELLER BRASS CO. STREAMLINE PRODUCTS

MUELLER BRASS CO. PORT HURON 2, MICHIGAN

HEATING AND VENTILATING

A MONTHLY MAGAZINE FOR ENGINEERS AND CONTRACTORS CONCERNED WITH THE DESIGN AND APPLICATION OF AIR CONDITIONING, REFRIGERATION, PIPING, AIR SANITATION, HEATING AND VENTILATION IN BUILDINGS

Member, Audit Bureau of Circulations.

Editorial Staff

Editor
CLIFFORD STROCK

Associate Editors
NATHAN N. WOLPERT
WILLIAM B. FOXHALL

Technical Consultant
T. W. Reynolds

Advertising Staff

Chicago
GEORGE G. TURNER
228 North La Salle Street.

New York
HARRY J. TWINE
148 Lafayette Street.

Cleveland
EDWARD B. McENTEE
17115 Hillsboro Road.

Los Angeles
ROBERT H. DEIBLER
2506 W. 8th Street.

Published by

THE INDUSTRIAL PRESS
148 Lafayette Street
New York 13, N. Y.

President
ROBERT B. LUCHARS

Vice-President and Treasurer
EDGAR A. BECKER

Secretary and Publishing Manager
HAROLD L. GRAY

Subscription Rates

Subscription rates in the United States and Canada, one year, $3; two years, $5; three years, $6; in all other countries, one year, $5; two years, $9. Single copies 30 cents. Entered as second-class matter, April 18, 1925, at the Post Office, New York, N. Y., under the act of March 3, 1879.

CONTENTS FOR JULY, 1951

VOLUME 48 NUMBER 7

ARTICLES

Effect of Ethylene Glycol 61
F. H. Bridgers and J. Bricker
How to Make a Survey for Air Conditioning 65
J. Partington, Jr.
Cooling an Egg Grading Plant 69
Predicting the Interchangeability of Fuel Gases 71
Heating and Cooling with Air in a Radiant Tile Floor 72
L. B. Nye, Jr.
Check Data for Air Conditioning and Ventilating Design 74
G. B. Priester
Window Air Conditioners Serve Texas Restaurant 76
Heat Pump Domestic Water Heater 77
G. G. Freyder
Research Projects Under Way in Engineering Schools 80
To Zone or Not To Zone 81
L. Smith
Corrosion Characteristics of Various Duct Materials 85
New Chemistry Building for Argonne National Lab. 86
Outstanding Lawsuits 87
L. T. Parker
Air Conditioning Cuts Losses in Photo Supplies 90

REFERENCE MATERIAL

Data Sheet—Selection of Unit Heaters ..... Opposite 126

DEPARTMENTS

Washington News—*Loring F. Overman* 53
Briefly Stated 56
Experience is My Classroom—*T. W. Reynolds* 91
Product Applications 92
Abstracts and Reviews 94
What Would You Do? 95
News of Equipment and Materials 96
New Catalogs ..... Opposite 102
Degree-Days for May, 1951 104
News of the Month 108
Getting Personal 120
Industrial Degree-Days for May, 1951 121
Coming Events 122

The Contents of HEATING AND VENTILATING are indexed monthly by Industrial Arts Index and by Engineering Index

Copyright, 1951, by The Industrial Press

Also Publishers of
HEATING & PLUMBING EQUIPMENT NEWS
and technical books.

THIS MONTH'S COVER

Through this industrial application of refrigeration, blood serum is desiccated in the frozen state. Flasks in the center are attached to a vacuum system with insulated drum containing low temperature coil suspended from ceiling. Photograph, courtesy General Electric Company.

Simplify Your Oil Burner Layouts
with this Modern Pipe Heating System!

"Simplicity of Thermal Electric design eliminates all of the headaches that go with the obsolete gadgetry of steam pipe heating.

"The pipelines are clean. Cumbersome steam heating has been junked in favor of passing low-voltage current through the pipeline itself. The heat generated makes even the crudest fuel flow like light oil.

"The fantastic jungle of pipes involved in recirculation has been scrapped. No need for them now since heat source is independent of boilers and burners.

"The ingenious Thermal Electric Tank Unit makes *unheated* storage practical. It eliminates steam coils in the fuel with their hazards of condensation, and leakage of oil into steam lines.

"On top of all this, Thermal Electric *guarantees* 100% automatic, trouble-free operation!

"What more could any engineer ask? Simplify your next bunker oil layout by specifying a Thermal Electric *Standard* System!"

HOW IT WORKS

Transforming Energizer (A) passes safe 20-volt current through the same pipe that carries the fuel (B). Oil is kept heated evenly at 120°F. over entire system. Thermostat (C) controls heat, makes system 100% automatic.

During intermittent shut-downs, heat temperature is maintained automatically. During seasonal shut-downs, fuel can solidify — Thermal Electric will melt out the pipe system.

HVS-1

PAT. NO. 2,224,409

Thermal Electric Fluid Systems

Fluid Systems Inc., 1881 Dixwell Ave., New Haven 14, Conn.

Please send me "The Common Sense of Heavy Fuel Transport" plus Customer List of hundreds of satisfied users.

*Name*_____ *Position*_____

*Firm*_____

*Address*_____

*City*_____ *State*_____

Move Any Industrial Fluid

Any Distance, at Any Temperature!

"Free yourself from the limitations of old-fashioned pipe heating methods with Thermal Electric Systems!

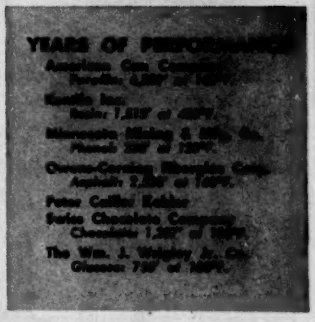
"With this all-electric transport system, it no longer matters how hot you must keep the fluid, how far you must move it, nor how exact your temperature control must be.

"Even the most acutely temperature-sensitive fluids are safely handled. Passing low-voltage current through the pipe that carries the fluid spreads even, low-density heat over the entire system, eliminating hotspots. Thermostatic controls won't let temperature vary more than 2°F.

"Different ambient temperatures are no longer a problem, as fluid temperature will not vary. Systems in tandem will bring fluid from cold exteriors to hot indoors with no temperature change.

"If you have a tough heating problem with any fluid, take a good hard look at versatile Thermal Electric *Industrial* Systems for viscous fluid transport!"

Fluid Systems Inc. are specialty engineers in the handling of industrial viscous fluids. We are available as special aides to consulting or staff engineers in designing transport systems for any fluid.



HVI-1

PAT. NO. 2,224,408

Thermal Electric Fluid Systems

Fluid Systems Inc., 1881 Dixwell Ave., New Haven 14, Conn.

Please send me "Simplified Industrial Fluid Transport Cuts Costs" plus customer list.

*Name*_____ *Position*_____

*Firm*_____

*Address*_____

*City*_____ *State*_____

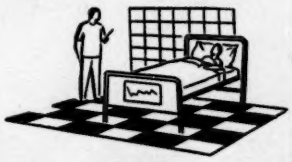
MASSELL

New Servel Water application and

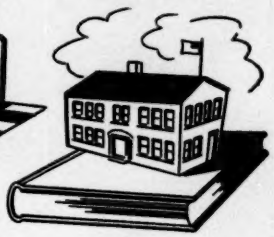
THE SERVEL WATER CHILLER—AN ECONOMICAL SOURCE OF CHILLED WATER OR AIR CONDITIONING

OFFICE BUILDINGS

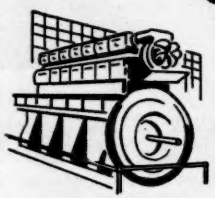
LARGE STORES



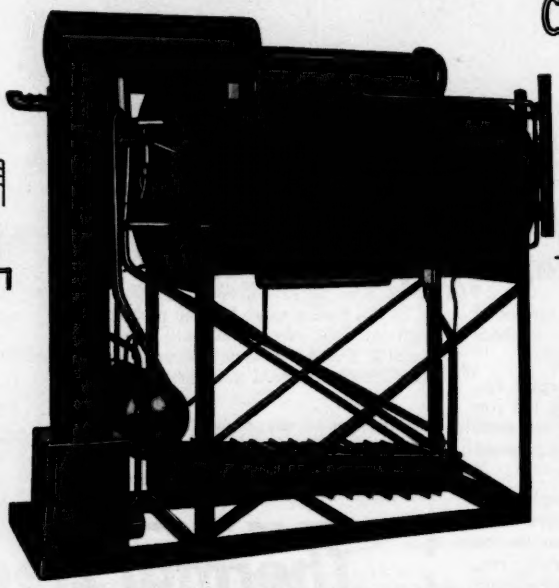
HOSPITALS



SCHOOLS



SPECIAL PRE-COOLING



DESCRIPTION: Rated capacity under standard ASRE conditions—25 tons. Hermetically sealed absorption refrigeration system. Refrigerant, water. Absorbent, lithium bromide. Source of energy, steam. Refrigeration unit operates under a vacuum, but the chilled-water circuit operates under ordinary pump pressure.

FACTORIES

INDUSTRIAL PROCESSES

HOTELS

SERVEL STEAM-OPERATED AIR CONDITIONERS

Self-Contained unit. 5 tons of refrigeration. Heating optional.
All-Year Air Conditioner. In 3-ton and 5-ton sizes. Cooling and heating.
For single or multiple installations.

MASSEEL

Chiller offers many operating economies

Uses steam from any source, even *waste* steam!

Electric-power needs are nominal

Light enough to install on any floor

Supplies chilled water or air conditioning

YOU'LL find it well worth while to consider the new Servel 25-Ton Water Chiller as a source of chilled water for industrial processing, or air conditioning. It's so light, quiet, and free from vibration you can install it on any floor, even the roof. You can operate it on steam from any source, at any pressure, produced with any fuel. If waste steam or waste heat is available, you can operate on it, and save most of the normal costs of fuel. And since electric-power requirements are negligible, you can usually connect it to existing electric systems.

Along with these installation economies, you get the operating benefits of Servel's famous no-moving-parts cooling system. This means dependable operation, long life, and low maintenance. You get unusually close control of temperatures, too, because you can modulate capacity as much as 50%.

Send today for full information. No obligation. And if you care to include details of your cooling or air-conditioning problem, we'll be glad to have our application engineers make suggestions.

WHY SERVEL IS YOUR BEST AIR-CONDITIONING BUY

• No moving parts in cooling system to wear out • Low maintenance costs • Long life • Hermetically sealed • Complete safety of operation • Chilled-water circuit operates under normal pump pressure

SEND COUPON FOR MORE INFORMATION

Servel

AIR CONDITIONERS

FOR INDUSTRY • FOR HOME • FOR BUSINESS

Servel, Inc.
Department S-27, Evansville 20, Indiana
Gentlemen:

Please send me more information on the following:

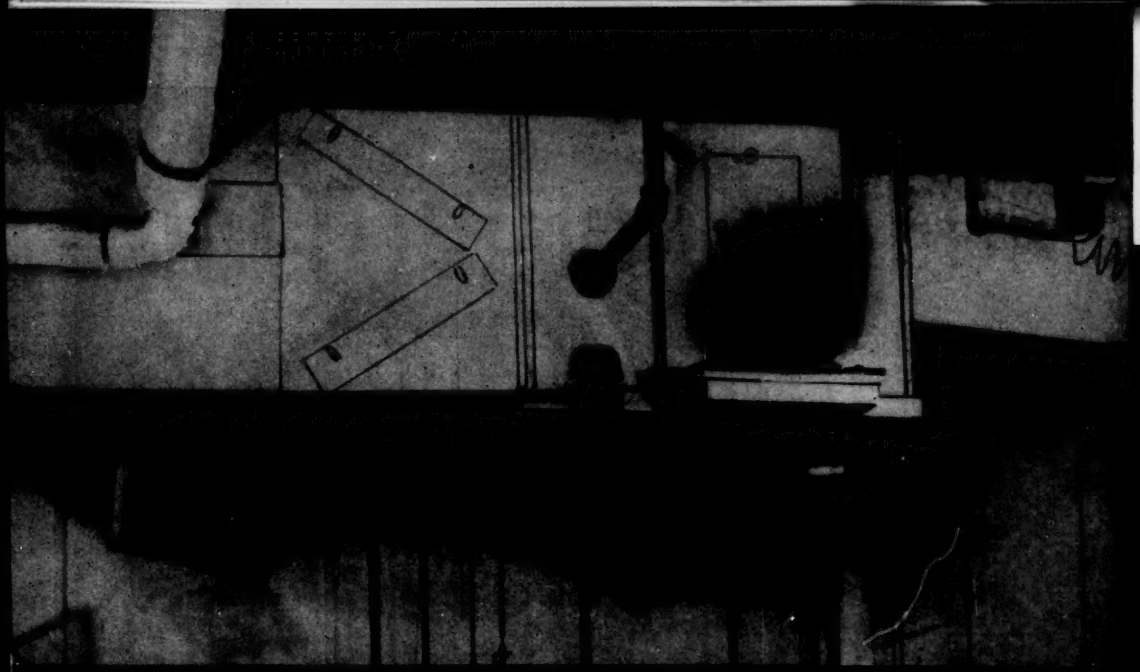
Servel 25-Ton Water Chiller_____
Servel Self-Contained Air Conditioner_____
Servel 3- and 5-Ton *All-Year* Air Conditioners_____

*Name*_____

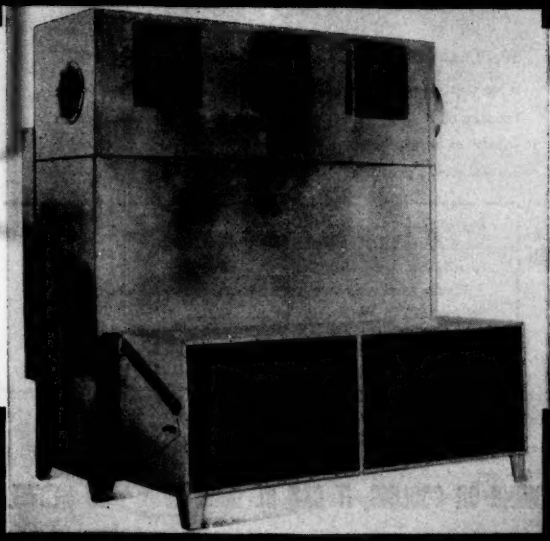
*Firm*_____

*Address*_____

IF YOUR JOB CAN BE DONE BETTER WITH AIR CONDITIONING OR COOLING, IT CAN BE DONE BEST WITH SERVEL



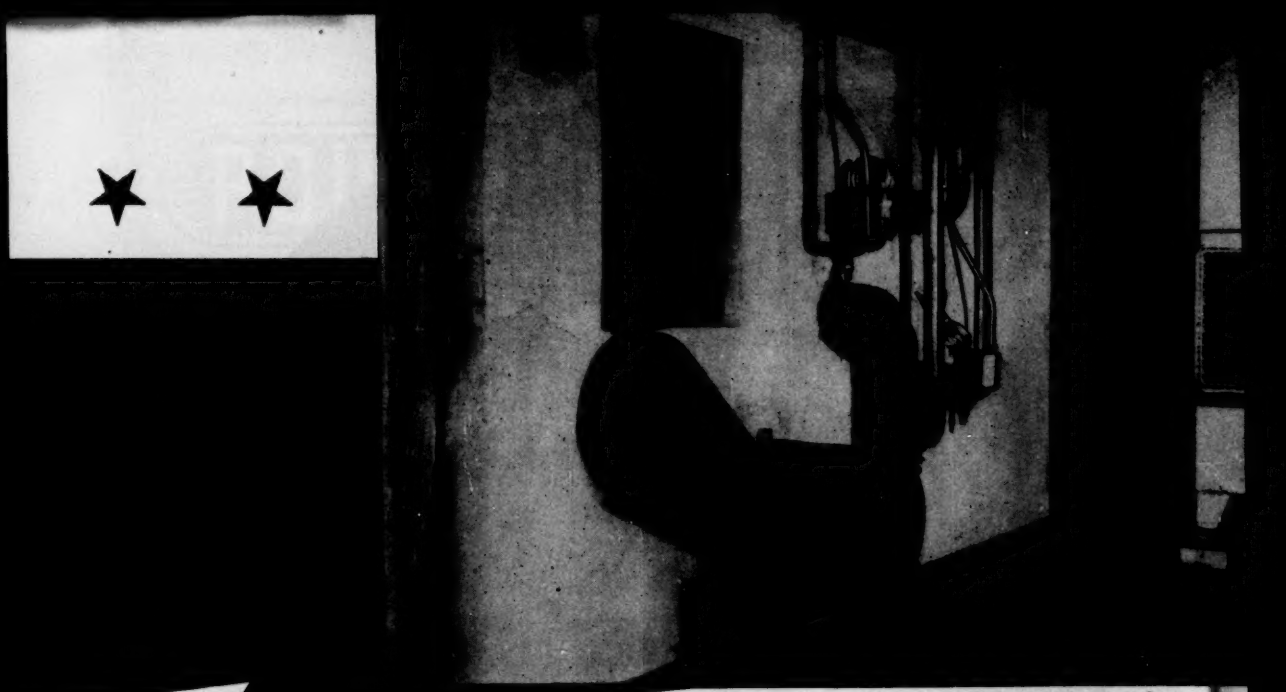
These "Buffalo" CABINETS



NO KNOCKING OUT WALLS

to bring this "Buffalo" VPC (vertical model) Cabinet into your plant. In 3 interchangeable sections, it can pass easily through standard doorways. This makes for simplified maintenance, too. Quality construction throughout includes heavy paneling and hollow shaft fans.

HEATING • COOLING



ARE SPACE-ECONOMIZERS!

FOR LONGER SERVICE AND BEST RESULTS

figure sturdy, efficient "Buffalo" Central Air Conditioning Cabinets in your plans. Central conditioning—one unit for a building, rather than many small units — is far cheaper and more satisfactory in the long run. LET US MAIL YOU BULLETIN 3703, FOR YOUR FILES.

AIR CONDITIONING UNITS

FAR-AIR® offers you...

Completely Automatic air filtration!

FAR-AIR Self-Washing Filters are a sound and profitable investment. The many *plus* features engineered into each unit assure outstanding performance. For instance, cleaning and re-oiling at the proper time for peak efficiency is controlled automatically, which virtually eliminates all maintenance except for periodic inspections. Other features include the prevention of oil entrainment, elimination of messy oil sumps (water and dirt are quickly flushed away), automatic fire control and ease of installation.

FAR-AIR Self-Washing Filters are adaptable to most air cleaning uses because they will handle any CFM requirement. The Farr Company engineer near you will be glad to suggest an installation to meet your specific problem. Complete literature is available upon request. Write Farr Company, 2615 Southwest Drive, Los Angeles 43, California.

FAR-AIR FILTERS

"Better by Farr"

*Trade Mark Reg.

FARR COMPANY *Manufacturing Engineers*

Los Angeles • Chicago • New York

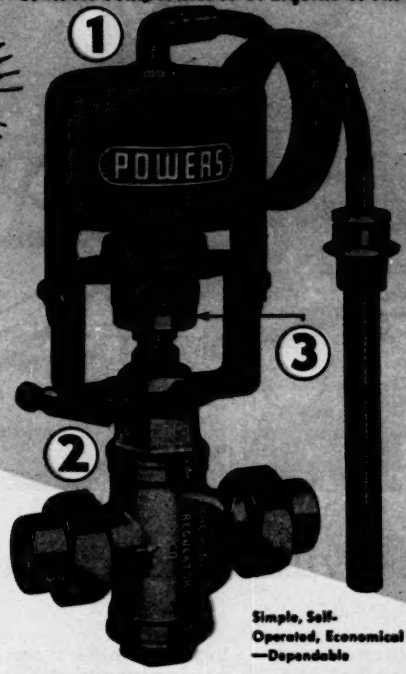
M'f'd under license by Control Equipment Co., Ltd. Montreal, Canada

POWERS

NO. 11 TEMPERATURE REGULATOR—*Controls Temperatures of Liquids or Air*

4 PLUS VALUES

1. OVER-heat Protection
2. Valve Stem Lubricator
3. Temperature Adjustment has ORILITE Thrust Bearing
4. Indicating Regulator Available *



Simple, Self-Operated, Economical —Dependable

Give

BETTER TEMPERATURE CONTROL

and Extra Years of Dependable Service

OFTEN PAYS BACK ITS COST SEVERAL TIMES EACH YEAR

When you want a simple dependable control to maintain a constant uniform temperature install a Powers No. 11 Regulator.

PREVENTS OVER-HEATING—SAVES FUEL and LABOR

HELPS INSURE A UNIFORM PRODUCT • MANY GIVE 10 to 25 YEARS OF SERVICE

For valuable aid in selecting the proper type and size of regulator take advantage of our 59 years of experience. Contact our nearest office or write to • THE POWERS REGULATOR CO., 2718 Greenview Ave., Chicago 14, Ill. • 231 E. 46th St., New York 17, N. Y. • 1808 W. Eighth St., Los Angeles 5, Cal. • 195 Spadina Ave., Toronto, Ont.

NO. 11 INDICATING REGULATOR

Has 4" Thermometer dial mounted on top of regulator. Both thermometer and bulb operate from same thermal system. Only one tapped opening required. Gives visual check on performance of regulator. Makes it easy to adjust for the right temperature.

WRITE FOR BULLETIN No. 329

THE POWERS REGULATOR CO., 2718 Greenview Ave., Chicago 14, Ill.

Gentlemen: Please send me Bulletin 329. Am interested in

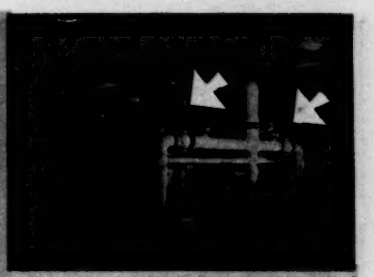
control for.....

Name.....Title.....

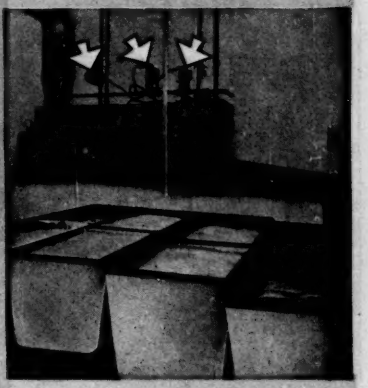
Firm Name.....

Address.....

A-11F



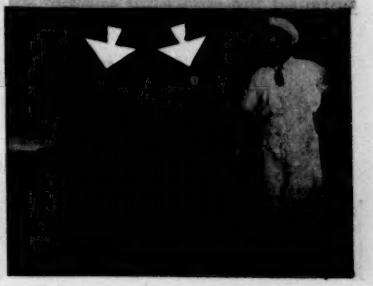
For WATER HEATERS and HEAT EXCHANGERS



For Air Conditioned Bakery Fermentation Rooms

Users report control within 1½°F. plus or minus on these two bakery processes.

For Air Conditioned Bakery Proof Boxes, above. Below: Ham Cooking Vats



Steel saved civilization at Augsburg

FOR 2000 years, the western world has survived vast waves of Asiatic invaders who threatened to destroy it. Repeatedly, the fate of civilization and Christianity has seemed to hang on the outcome of a single battle.

Such a decisive action was fought at Augsburg, South Germany, in 955 A.D. Swarming out of Asia, savage Magyars overran the rich Danube Valley. They ravaged the prosperous lands of Germany, Italy and France. At last, under Otto, King of Saxony, the armored Knights of Christendom rallied. They faced a hundred thousand fierce foes. The battle raged all day. Thousands were slain. At last the tide turned and the Magyars fled. For three days the Knights pursued the scattered enemy, killing or capturing thousands more. Symbolic of the west's predominance in weapons and armor of iron and steel, victory was credited to King Otto's iron-tipped Holy Lance.

Augsburg ended the Magyars' attempts to conquer Europe. They settled down to peaceful living in their valley and within 50 years accepted Christianity. Again, history demonstrated the truism that no people or alliance can establish supremacy unless it first predominates in the production and use of iron and steel.

It is reassuring that America produces twice as much steel as the rest of the world combined. America has the steel to win. We will use enough of it to protect our leadership of a free Christian world.

Scrap Metal is Critical Again

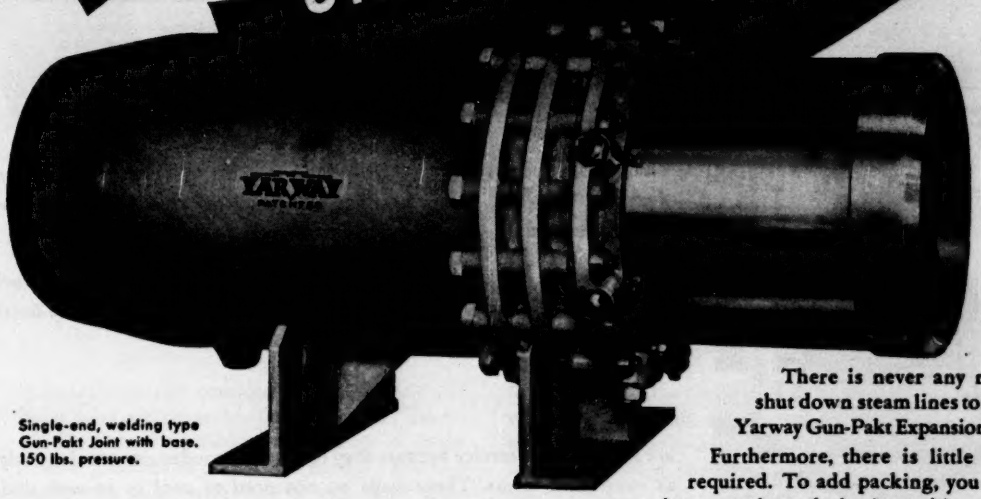
The Youngstown Sheet and Tube Company

General Offices—Youngstown 1, Ohio
Export Offices—500 Fifth Avenue, New York

MANUFACTURERS OF CARBON ALLOY AND YOLOY STEELS

The steel industry is using all its resources to produce more steel, but it needs your help and needs it now. Turn in your scrap, through your regular sources, at the earliest possible moment.

THIS EXPANSION JOINT IS SERVICED UNDER FULL STEAM PRESSURE



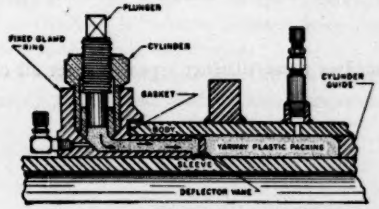
Single-end, welding type Gun-Pakt Joint with base. 150 lbs. pressure.

There is never any need to shut down steam lines to service Yarway Gun-Pakt Expansion Joints. Furthermore, there is little service required. To add packing, you simply insert a plug of plastic packing, turn a wrench, and the job's done! Special Alemite fittings provide for proper lubrication.

Maintenance costs are trifling. One large user reports 65 cents per year per joint. Others claim less than that.

Gun-Pakt Joints are available with single or double-ends, welding or flanged types, in sizes from 2" to 30", with traverses from 4" to 24", and for pressures to 400 psi.

For the full Gun-Pakt story, write for Yarway Bulletin EJ-1912.



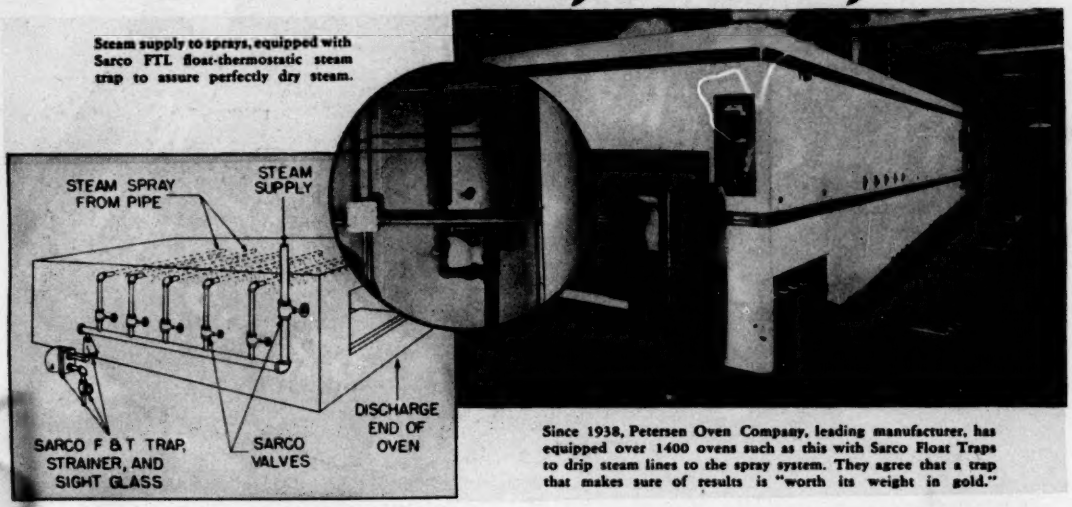
Close-up of cross-section showing detail of Gun-Pakt feature.

YARNALL-WARING COMPANY
104 Mermaid Avenue, Philadelphia 18, Pa.
Branch Offices in Principal Cities

YARWAY **GUN-PAKT EXPANSION JOINT**

Worth its weight in Gold

Steam supply to sprays, equipped with Sarco FTL float-thermostatic steam trap to assure perfectly dry steam.

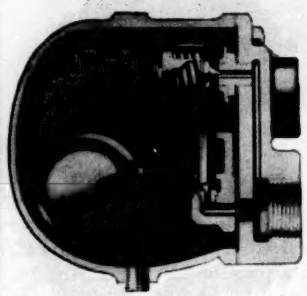


Since 1938, Petersen Oven Company, leading manufacturer, has equipped over 1400 ovens such as this with Sarco Float Traps to drip steam lines to the spray system. They agree that a trap that makes sure of results is "worth its weight in gold."

Schematic diagram of typical spray system for bake ovens, showing Sarco FT drip trap.

On steam spray systems, used in the big automatic gas ovens, to give that well browned, glossy finish to rye bread and rolls, absolutely dry steam is essential.

If water were allowed to pass along the steam supply line and reach the nozzles, the fine, hot, uniform mist would turn to rain and the finish would be ruined.



Sarco Float-Thermostatic Steam Trap

Built-in air vent has standard Sarco helical bellows. Air binding is impossible. All mechanism on cover, reached for inspection or cleaning without disturbing piping connections. Three types, 5 sizes, six pressure ranges.

SARCO FLOAT • THERMOSTATIC STEAM TRAPS

are ideal for this service because they discharge condensate continuously, as soon as it forms. These traps do not need to cool or to wait until steam leaks out of buckets, before they fill and discharge.

The built-in air vent positively prevents air binding. Instantly ready—always on the job.

New Bulletin No. 456 describes three distinct types to meet all conditions. Write for it today.

341

SARCO COMPANY, INC.

Represented in Principal Cities

Empire State Building, New York 1, N. Y.

SARCO CANADA, LTD., TORONTO 5, ONTARIO

SARCO SAVES STEAM

IMPROVES PRODUCT QUALITY AND OUTPUT

It's a "snap"

to combine beauty with efficiency

in **kno·draft** adjustable air diffusers

Is beauty your first consideration . . . or efficiency? Never mind, you get both with Kno-Draft *Adjustable* Air Diffusers. Leaf through our album of distinguished installations and see, for example, how well Kno-Draft's quiet beauty fits in with either traditional paneling or modern fenestration.

At Oak Ridge, of course, efficiency was a first thought. So, too, at Kaufmann's of Pittsburgh, where Kno-Draft High Pressure Diffusers were chosen for their space-saving advantages.

Kno-Draft *Adjustable* Air Diffusers circulate air gently and *without draft* . . . keep temperature uniform throughout the conditioned space. And both air volume and direction are adjustable *after* installation . . . thus simplifying preliminary engineering as well as providing flexible control for present and future needs.

Whatever the air distribution requirements, there are Kno-Draft units in types and sizes to meet them. Send for complete data.

KNO-DRAFT DATA BOOK: Complete specifications, engineering and installation data on Kno-Draft *Adjustable* Air Diffusers. To get your copy, simply fill in and mail the coupon. No obligation, of course.

TRADE MARK "KNO-DRAFT" REG. U. S. PAT. OFF.

W. B. CONNOR ENGINEERING CORP.
Danbury, Connecticut
Air Diffusion • Air Purification • Air Recovery
In Canada: Douglas Engineering Co., Ltd.,
190 Murray Street, Montreal 3, P. Q.

W. B. CONNOR ENGINEERING CORP.
Dept. J-71, Danbury, Connecticut

Please send me, without obligation, my copy of the Kno-Draft Air Diffuser Data Book.

Name.....

Position.....

Company.....

Street.....

City.....Zone.....State.....

THE CHICAGO PUMP IS A BETTER PUMP

Figure V 9500—Type AVC Condensation Pump and Receiver. Receiver serves as base. Low inlet — suitable for floor mounting or shallow pit. No foundation bolts necessary. Ask for Bulletin 245.

Figure L 9700—Type CLL1 Vertical Condensation Pump. Extra heavy duty unit. Specifically designed for low return service and underground installations. Ask for Bulletin 255.

. . . For Every Heating Purpose

Get the pump that is specifically designed for the particular job. For below floor returns, for low vacuum systems, for small capacity high pressure requirements, for any standard heating system or any unusual condition there is a Chicago Heating Pump that will do the job better.

All ratings and receiver capacities meet or exceed ASHVE standards.

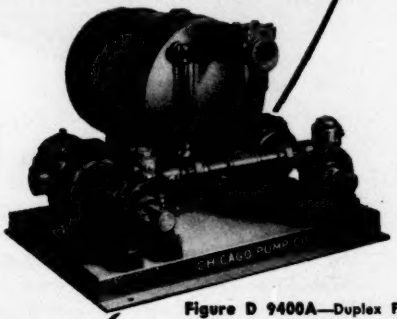
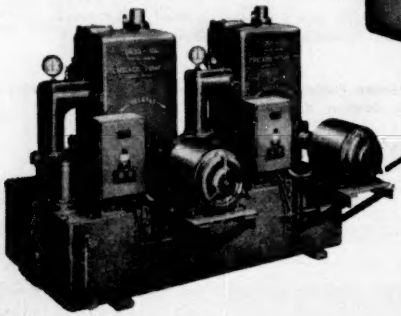


Figure D 9400A—Duplex FC Condensation Unit. For duty up to 50,000 EDR and discharge pressures up to 150 lbs. Ask for Bulletin 260.

Figure D 9900—Duplex Condo-Vac Return Line Vacuum and Boiler Feed Pump for vacuum heating systems. Pressures up to 40 lbs., and from 2500 to 150,000 EDR. Ask for Bulletin 270.



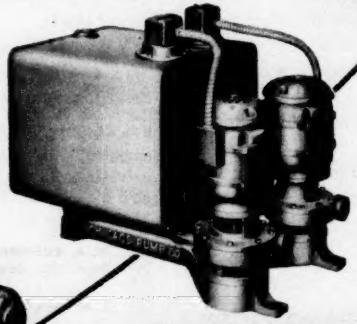


Figure D 9200—Sure Return Condensation Pump and Receiver. For systems up to 75,000 EDR and for low and medium pressures. Available in either single or duplex units. Ask for Bulletin 250.

CHICAGO PUMP COMPANY

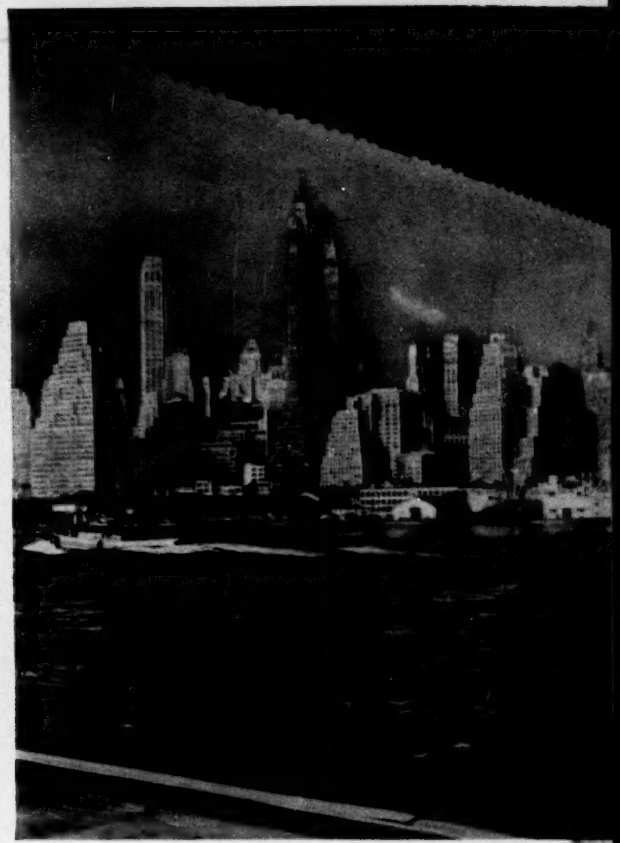
BUILDING and INDUSTRIAL DIVISION

2300 WOLFRAM STREET — **CHICAGO 18, ILLINOIS**

Condo-Vac, Sure Return, AVC, LVC, Fire, House & Circulating Pumps
Pneumatic & Tankless Water Systems

Flush-Kleen Sewage Ejectors
Little Giant & Non-Clog Bilge Pumps
Pumps for every industrial use.

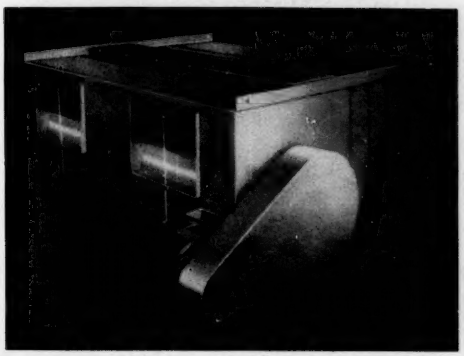
American Blower—a time-honored name in air handling



If you look before you buy, we're certain you'll buy American Blower Air Handling Products. There's a big difference in quality, design, quietness, operating costs and efficiency. Test after test by buyers has proved American Blower superiority.

In New York, as in other cities, American Blower Air Handling Products serve commerce, industry and public utilities. For air handling data in the New York area, call American Blower—Bryant 9-2885. In other areas, consult your phone book.

Product of the month



American Blower Heating and Ventilating Unit. 7 Sizes. Capacities from 1,000 to 15,000 cfm and 45,000 to 976,000 Btu/hr.

Prepare now for winter comfort

Now is the time to make your plans for winter heating. And we'd like to suggest that you include American Blower Heating and Ventilating Units in these plans.

Engineered to provide efficient, comfortable heating in offices, auditoriums, gymnasiums, laboratories, lobbies, schools, stores and similar applications, users find these dependable units an unusually profitable investment.

They are available in seven sizes, for wall, horizontal, inverted and floor installation. Humidifiers, face and by-pass dampers, filter boxes and mixing boxes are available for complete winter comfort conditions. Each fan housing is equipped with an American Blower Aileron to control the flow of air from the slow speed centrifugal fans.

Investigate the many advantages of American Blower Heating and Ventilating Units. For additional information, call your local American Blower Branch Office.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of American Radiator & Standard Sanitary corporation

YOUR BEST BUY AMERICAN BLOWER AIR HANDLING EQUIPMENT

Serving home and industry

AMERICAN-STANDARD · AMERICAN BLOWER · CHURCH SEATS · DETROIT LUBRICATOR · KEWANEE BOILERS · ROSS HEATER · TONAWANDA IRON

Can you afford to waste what Iron Fireman users are saving?

Install Iron Fireman GAS FIRING

for medium or large heating jobs

1. Iron Fireman Radiant "Inshot" Gas Burner
This low pressure burner has an efficient firing range of 10% to 100% of capacity, making it a particularly effective burner for modulated firing. Opposed gas jets and an improved method of air entrainment produce an intense radiant flame. Capacities range from 6 to 500 boiler h.p.

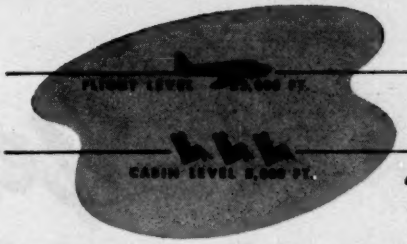
2. Iron Fireman Vertical Type Gas Burner
This gas burner is readily adaptable to a wide range of firebox dimensions and is easily installed in any conventional boiler setting. Zone fire control permits low-fire start and modulated firing. Low pressure gas. Capacities from 6 to 500 boiler h.p.

3. Iron Fireman Gas-Oil Combination
Iron Fireman Ring Type gas burner combined with Iron Fireman Horizontal Rotary oil burner permits quick fuel change to meet sudden emergencies, or avoid interruption during daily or seasonal gas shortages. Can also be combined with Iron Fireman Pneumatic Spreader stoker. Capacities up to 500 boiler h.p.

A heating survey made without cost or obligation to you, will show you what you can save with Iron Fireman gas firing. For such a survey, or descriptive literature, write Iron Fireman Mfg. Co., 3162 W. 106th Street, Cleveland 11, Ohio, or call nearest Iron Fireman dealer.

IRON FIREMAN

AUTOMATIC FIRING EQUIPMENT FOR GAS, OIL, COAL



In modern air-liners you breathe comfortably at altitudes of 25,000 ft., because your cabin is "Pressurized" — air pressure inside the plane is kept at or near normal sea level pressure.

Boilers, too, "breathe" easier when their combustion air is "pressurized" using forced draft

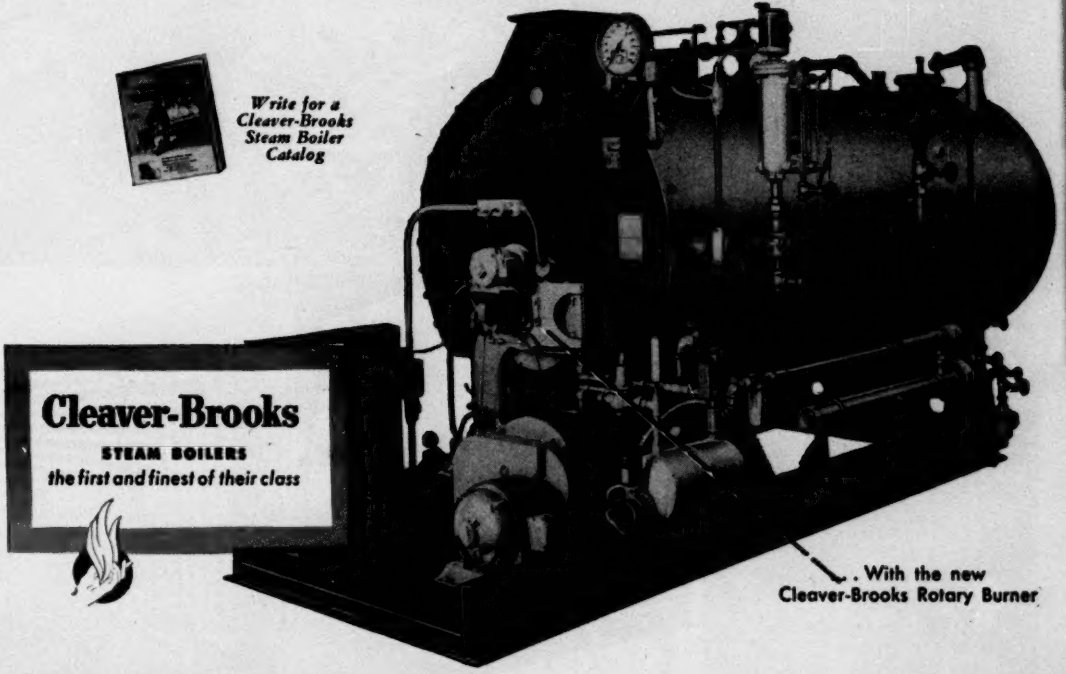
Cleaver-Brooks experience with thousands of steam boilers, of the self-contained type, has conclusively proven these operating advantages of forced draft:

- — because atmospheric boiler-room air is constant in temperature and therefore in density, the weight of air delivered for combustion by a forced draft fan is also constant and always gives proper air-fuel ratio (CO_2) resulting in maximum efficiency and freedom from combustion problems.
- — the electrical load, or power requirement, of a forced draft fan is at a minimum, because the fan handles a lesser volume of air.
- — low fan maintenance and longer fan life with forced draft fans since they operate with cool, clean boiler room air — no problems with high bearing temperatures and corrosion.
- — air is under pressure in the combustion chamber of a forced draft boiler, with no possibility of "diluting" air entering the chamber. Maximum boiler efficiencies are always attained when head plates and casings are tight.
- — lower initial fan cost, better space arrangement, and better appearance are gained because forced draft fans are considerably smaller.
- — casings for forced draft fans are cool — require no insulation — contribute to safer operation and cooler boiler rooms.

Forced draft is one of many reasons why you get a greater return from your investment in a Cleaver-Brooks boiler — a boiler of foremost quality in every detail and with many immediate and long-range cost-saving features. Cleaver-Brooks self-contained boilers are available for oil, gas, combination oil and gas firing — 15 to 500 hp., 15 to 250 lb. p.s.i.

CLEAVER-BROOKS COMPANY
366 E. Keefe Ave., Milwaukee 12, Wis.

Write for a Cleaver-Brooks Steam Boiler Catalog

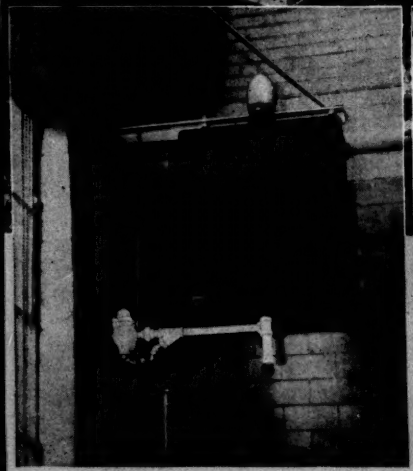


. With the new Cleaver-Brooks Rotary Burner

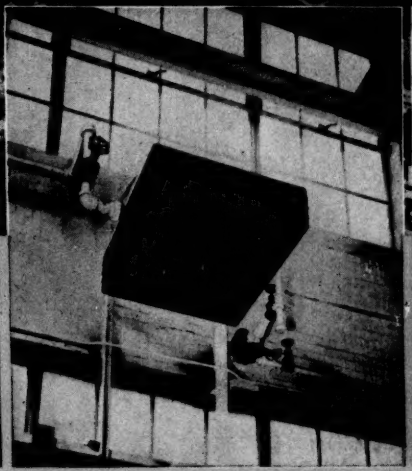
51 Years of

TEXTILE MACHINE WORKS

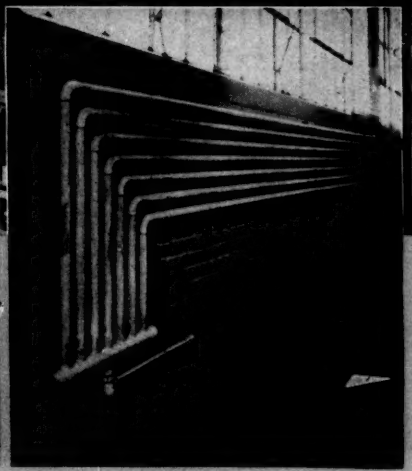
World's largest manufacturers of full-fashioned knitting machinery, spring-beard needles, and rotary braiding machines. Foundry which makes castings for many manufacturers has furnished over 200,000 castings for Webster Drip Traps.



1



2



3

Industrial Growth

Competent Management, Continuous Plant Expansion, and 51 Years a Webster Customer

Plant expansion is practically continuous at the famed Textile Machine Works in Reading, Pa. On August 29, 1900, Textile Machine Works bought their first Webster Steam Heating Equipment. Today the entire plant is Webster-equipped, old buildings as well as new.

Heating comfort is provided for approximately 4,000 employees in buildings that total 400,000 square feet of floor space.

Webster Thermostatic Traps are used on all radiators and unit heaters. Webster Dirt Strainers give protection for traps draining unit heaters and process equipment.

Pipe coils, still in service in older sections, have given way to Webster Walvector in new office sections. Webster Walvector spreads the heat evenly along outside walls. Heating requirements in certain new plant sections are met with Webster-Nesbitt Unit Heaters.

An annual heating check-up is standard procedure at Textile Machine Works. Taking one building at a time, the maintenance crew checks every item of heating equipment and replaces inoperative units.

Webster service to Textile Machine Works is provided by Harry Doerrfuss, 28 years with Webster, of Webster's Philadelphia Office. There is a Webster Representative near you—call him or write us for his name.

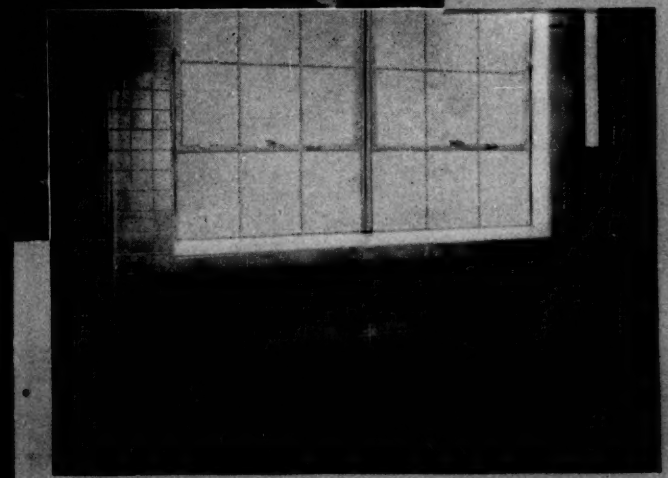
Address Dept. HV-7

WARREN WEBSTER & COMPANY

Camden 5, New Jersey : : Representatives in Principal Cities

In Canada, Darling Brothers, Limited, Montreal

Webster HEATING

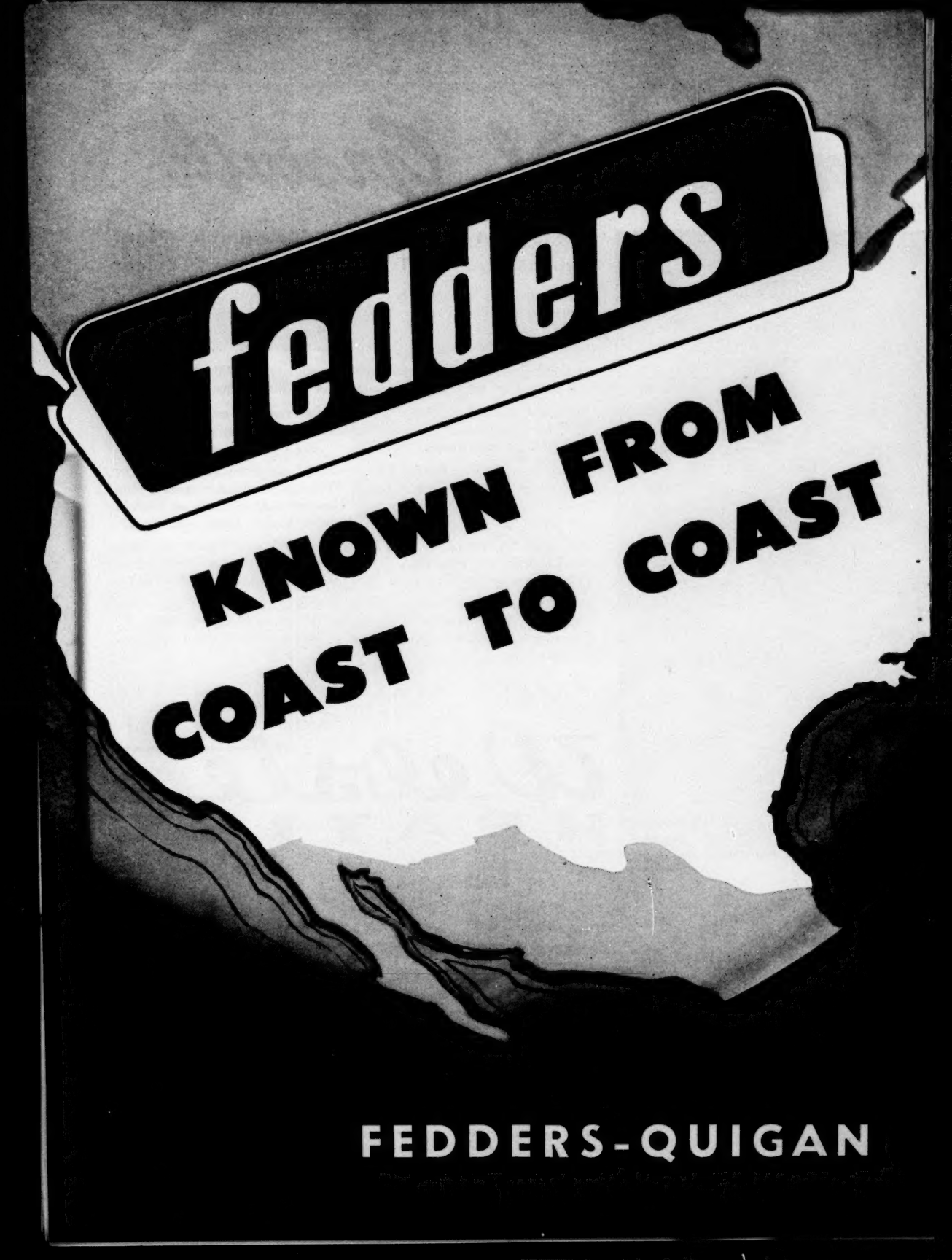


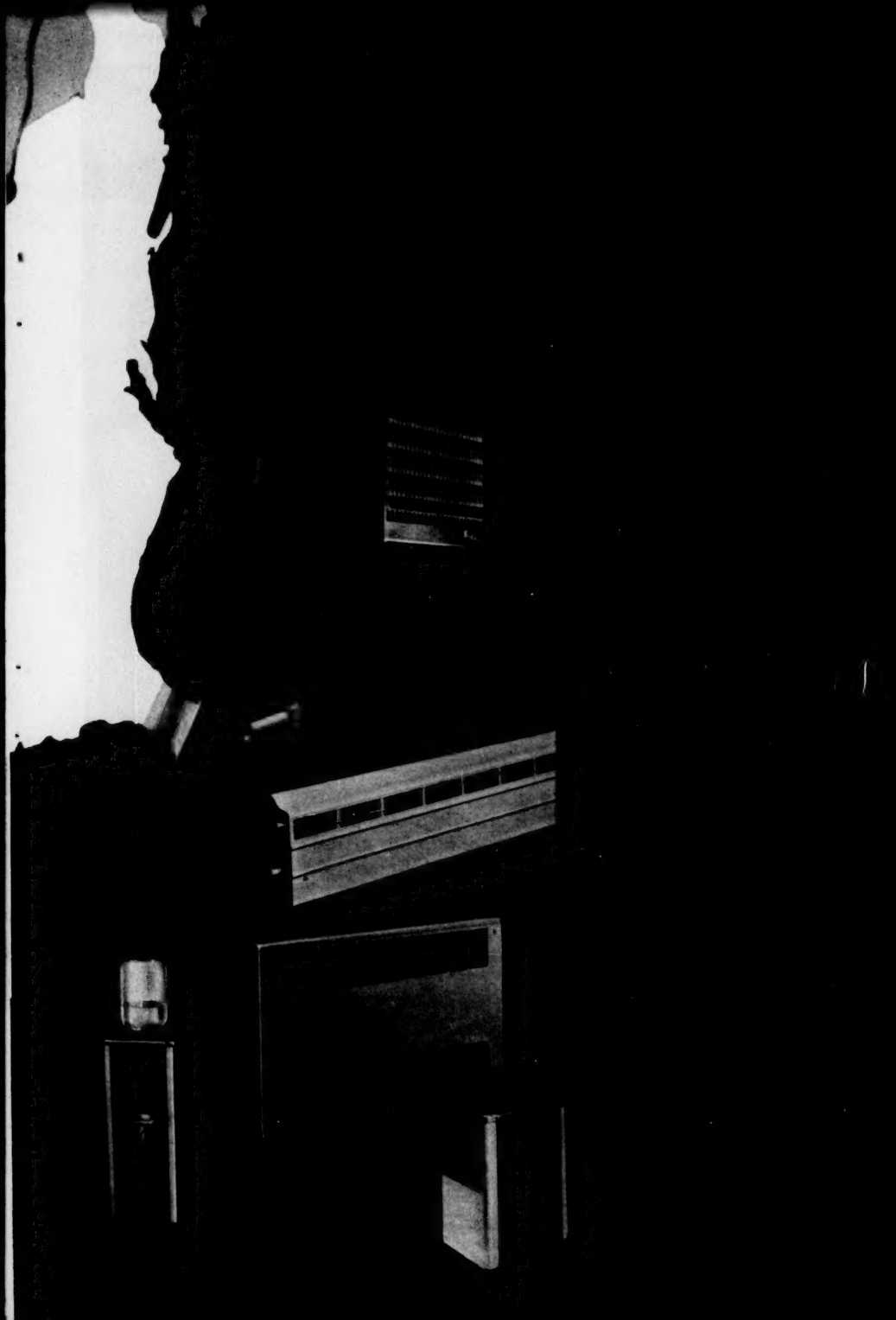
1 Webster-Nesbitt Propeller-Fan Unit Heater in new power house, with Webster Drip Trap and Strainer.

2 Webster-Nesbitt Down-Blow Unit Heater in new erecting shop, with Webster Drip Trap and Strainer.

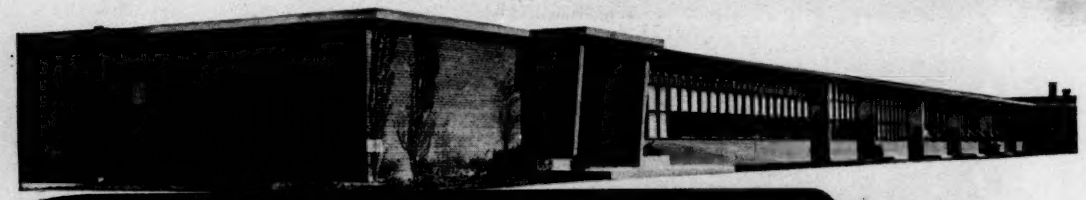
3 Webster Thermostatic Trap on pipe coil radiation in machine shop. Pipe coils were used regularly by Textile Machine Works prior to the development of Webster Walvector. Typical coil, illustrated, spread over about 26 feet of wall space, to a height of about 3 feet and provided a heat output of slightly over 100 sq. ft. of EDR. It required more than 400 lbs. of steel pipe.

4 Webster Walvector in new power house. The unit illustrated spreads the heat over about 10 lineal feet of wall space, can be installed in as little as 17 inches of height and produces just about the same heat output as the coil. Total weight of materials required is less than 15% of the weight of the pipe coils.

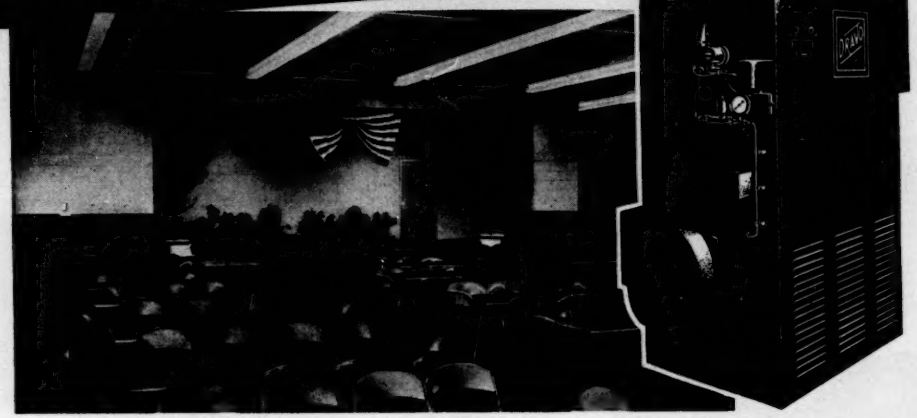

fedders
KNOWN FROM
COAST TO COAST
FEDDERS-QUIGAN



CORPORATION BUFFALO 7, N. Y.



HERE'S *HOW* AN ARCHITECT BUILT A SCHOOL AROUND THE HEATING AND VENTILATING SYSTEM AND SAVED 30% ON SYSTEM INSTALLATION



Listed by Underwriters' Laboratories

Approved by American Gas Association

Dravo "COUNTERFLO" Heaters operate automatically, provide constant-temperature fresh air to Hillsborough School.

When the Hillsborough, New Jersey, School was built, architect Jay C. VanNuys specified Dravo "Counterflo" Heaters and built the school *around* the heating and ventilating system, rather than trying to "fit" the system to the school.

Two direct-fired "Counterflo" Heaters, with an output of 1,750,000 Btu per hour each, heat 20,000 cu. ft./min of fresh filtered air for the 21 rooms of the new school building during the winter months. In warm weather, these same heaters provide comfortable ventilation for the entire school.

The heating and ventilating system is thermostatically controlled and automatic in operation. The unique construction of the school eliminated the need for duct work.

THE RESULTS? The Dravo heater installation at 81¢ per sq. ft. cost 30% less than would a conventional "wet" system; heating and ventilating represented 7% of the total building cost.

Versatile Dravo Heaters can solve many school heating problems.

Dravo "Counterflo" Space Heaters are ideal for heating and ventilating such school facilities as . . . gymnasiums . . . auditoriums . . . stadium rooms . . . libraries . . . cafeterias . . . book stores . . . locker rooms . . . field houses . . . school garages . . . indoor swimming pools . . . manual training shops . . . laundries . . . classrooms.

DRAVO HEATERS OFFER YOU—

- **Low initial cost . . . users report 50% to 60% savings.**
- **Concentration of heat at working level.**
- **Low Fuel consumption . . . burn gas or oil . . . easily converted.**
- **Automatic Control . . . on-off or modulating controls.**
- **Long service life, low maintenance . . . stainless steel combustion chamber.**
- **Mobility . . . easily moved to any location.**
- **Flexibility . . . where floor space is limited, can be wall-hung or suspended from trusses.**

Planning a school building? Why not look into the possibilities of Dravo "Counterflo" Heaters for your heating and ventilating needs? Write today for Catalog NO—524

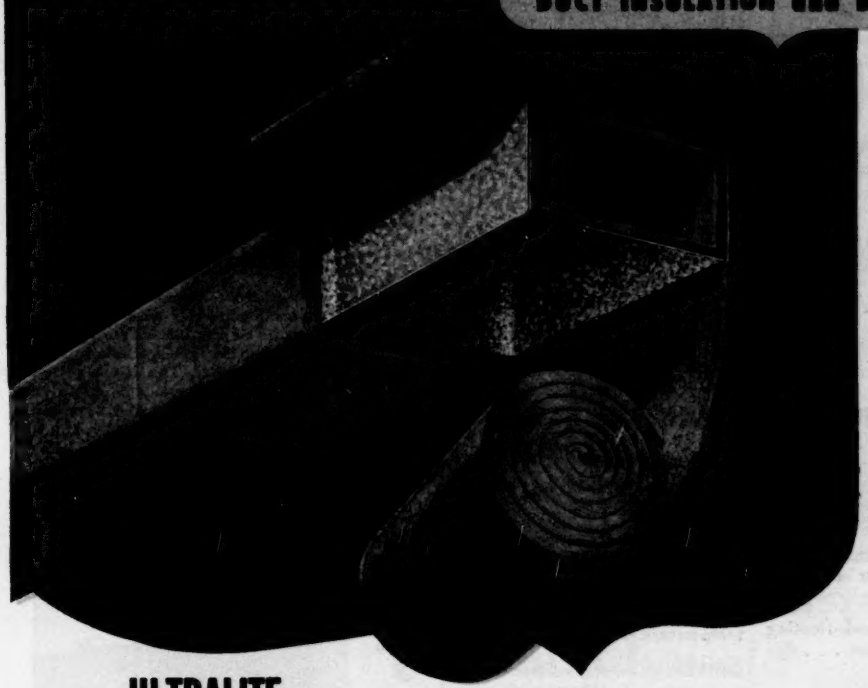
DRAVO CORPORATION
HEATING DEPARTMENT, DRAVO BUILDING, PITTSBURGH 22, PA.
Sales Representatives in Principal Cities

Manufactured and sold in Canada by Marine Industries, Ltd., Sorel, Quebec
Export Associates: Lynch, Wilde & Co., Washington 9, D.C.

It's "DUCT SOUP" to line and wrap ducts with

ULTRALITE

DUCT INSULATION and DUCT LINER



ULTRALITE, the long glass fiber insulation, goes on faster, easier, and cheaper than any insulation you've ever used! For Ultralite Duct Insulation and Duct Liner have every characteristic that makes application easy and quick. They're light, flexible, resilient; you can cut them with a knife; run them quickly around curves and corners; adhere them to metal with adhesives . . . screws and washers . . . wires. Try Ultralite—soon!

ULTRALITE DUCT INSULATION — THERMAL

A soft, resilient, flexible insulation of long, fine glass fibers with a low K-Factor. Available plain or with your choice of 4 vapor barrier facings, already adhered to the insulation. Wrap-around method of application cuts applied costs way down. Non-irritating, pleasant to handle. Fire-resistant, non-corrosive to metals.

ULTRALITE DUCT LINER — ACOUSTICAL

This is the duct liner that won't burn—a flexible, resilient, semi-rigid glass fiber insulation designed specifically as acoustical duct liner. Won't break, flake or chip. Runs quickly around curves and corners. Friction loss is low. Won't delaminate under air movement; won't flake off in air stream.

For free samples and catalog A.I.A. File No. 37-D-2, WRITE TODAY!

Please send me samples of ULTRALITE and catalog A.I.A. File No. 37-D-2. HV-7

NAME_____

COMPANY_____

ADDRESS_____

CITY_____ STATE_____

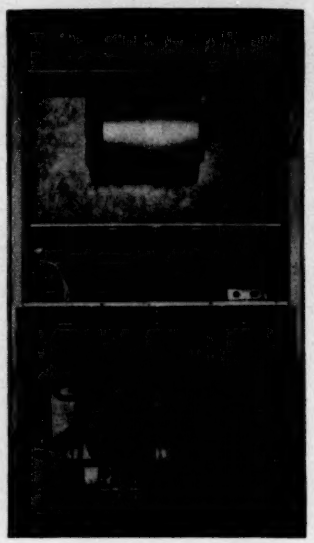
GUSTIN-BACON MANUFACTURING CO.

GUSTIN-BACON MFG. CO.

1412 WEST 12TH ST., KANSAS CITY, MO.

New York Chicago Philadelphia San Francisco Los Angeles Houston Tulsa Ft. Worth

EVERYTHING YOUR CUSTOMER WANTS



IN A PACKAGE AIR CONDITIONER

Here are the reasons why your customer will be happy with his Worthington Package Air Conditioner:

QUIET—acoustically insulated cabinet . . . no belts to wear or get out of line.

VIBRATION-LESS—smooth-floating multi-mounted compressor . . . dynamically-balanced fan.

TROUBLE-FREE—compressor hermetically-sealed against dust and moisture . . . no pulleys, couplings or seals.

NO ATTENTION NEEDED—pressure-type oiling . . . never needs replenishing.

LONG LIFE—compressor surfaces finished to micro-inch accuracy . . . oversize bearings . . . four rings per piston . . . dynamically-balanced crankshaft.

SAFE—high-pressure cut-out . . . high temperature safety switch.

CONVENIENT—finger-tip selection of temperature . . . thermostatic control . . . finger-tip adjustment of louvres.

ATTRACTIVE—plastic baked-enamel finish, scratch-resisting, washable . . . rounded corners, no projections . . . no "sweating".

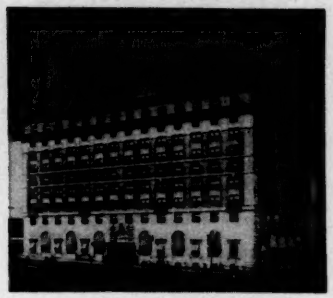
ECONOMICAL—thermally-insulated . . . large copper-finned cooling coils . . . Worthington Feather* Valves.

Each Worthington unit—3, 5 and 7½ ton sizes**—is built to the same high quality standards as Worthington equipment for engineered systems, such as those described at the right. *Write for Bulletin C1100-B29.*

*Reg. U. S. Pat. Off. **Also, for remote location: 7½, 10, 15, 20, 25 ton units

Another "Worthington-Conditioned" hotel

in the National Hotel Co. chain



The 400-room Washington Hotel, one of the leading hotels in the nation's capital, gets its air conditioning from a Worthington centrifugal refrigeration system, using chilled water. This is one of five National Hotel Company hotels to be Worthington-conditioned; the others are Hotel Jung, New Orleans; Travis Hotel, Dallas; Thomas Jefferson Hotel, Birmingham; Hotel Cortez, El Paso.

Off-and-On heat calls for Off-and-On cooling

The work performed in the research laboratory of Aluminum Company of America, East St. Louis, Ill., is of such a nature that excessive heat is produced intermittently.

Certain of the rooms are provided with a "wild zone" of air conditioning which goes into operation automatically when the heat-producing equipment is in use, and the normal air conditioning zone cannot handle the load.

This building is handled by a 125-ton Worthington air conditioning system comprised of two Freon-12 compressors and one evaporative condenser.

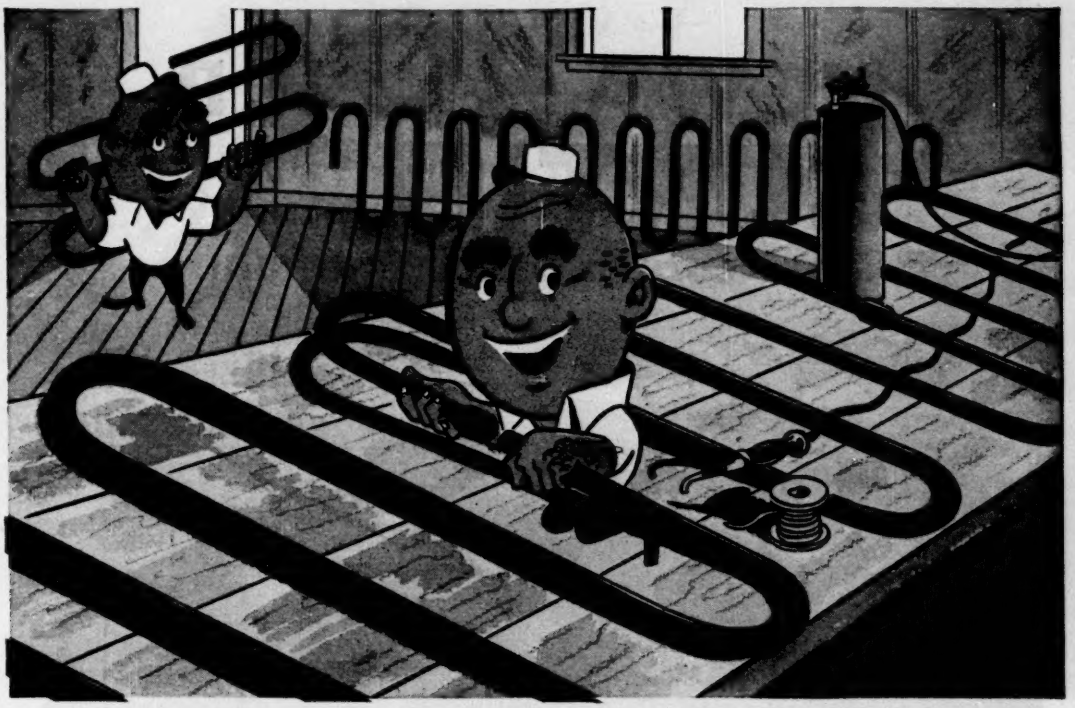
WORTHINGTON

AIR CONDITIONING AND REFRIGERATION

INVESTIGATE

MORE WORTH WITH WORTHINGTON

Consult Classified Telephone Directory for nearest Worthington distributor. Worthington Pump and Machinery Corporation, Air Conditioning and Refrigeration Division, Harrison, N. J., specialists in air conditioning and refrigeration for more than 50 years. A.1.3



Form radiant heating grids faster, too . . . with Bundyweld

NOTE that Bundyweld expanded end, above. It spells *even easier* radiant heating installation!

For twenty-foot lengths of Bundyweld Tubing can be sent to your building site with one end expanded (*if specified*). Then, one man quickly forms grid on simple fixture . . . slips unexpanded end into expanded end of the next grid, and silver brazes (or soft solders) grids into strong, permanent, leakproof union.

Two men can easily position the rigid, lightweight Bundyweld sections on ceilings or in floors. No hitches, delays. In jig time, your Bundyweld radiant heating system is all set, to the tune of a major savings in time and costs.

Bundyweld is double-walled from a single strip, copper-bonded through 360° of wall contact. It's stronger-walled, thinner-walled; bends more readily without collapsing structurally. Uniformity, even flow, maximum heat conductivity are yours!

Write today for the complete Bundyweld radiant heating story. ***Bundy Tubing Company, Detroit 14, Michigan.***

Bundyweld® Tubing

DOUBLE-WALLED FROM A SINGLE STRIP

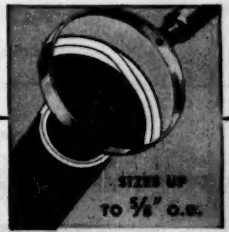
WHY BUNDYWELD IS BETTER TUBING

Bundyweld starts as a single strip of basic metal, coated with a bonding metal. Then it's . . .

continuously rolled twice around laterally into a tube of uniform thickness, and

passed through a furnace. Bonding metal fuses with basic metal, presto—

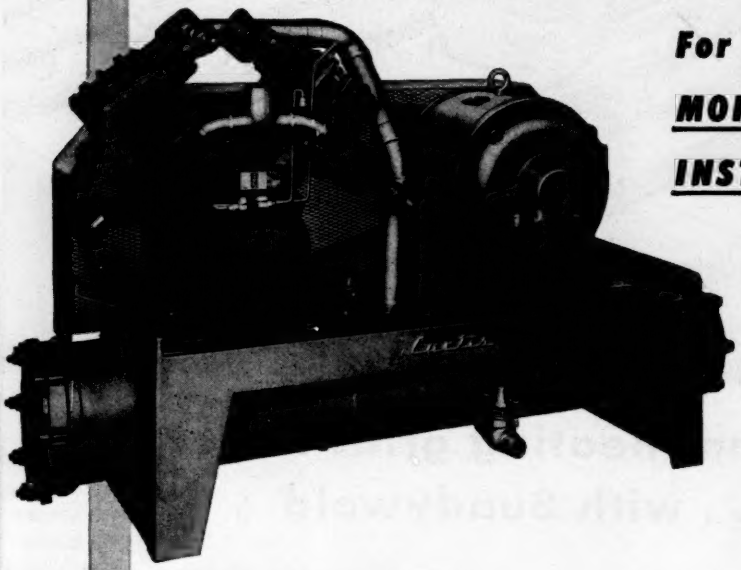
Bundyweld . . . double-walled and brazed through 360° of wall contact.



NOTE the exclusive patented Bundyweld beveled edge, which affords a smoother joint, absence of bead and less chance for any leakage.

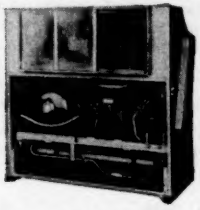
NOW A 40 H. P. CURTIS

WATER-COOLED CONDENSING UNIT



For LARGER, MORE PROFITABLE INSTALLATIONS

Packaged Type,
2, 4, 6, 8 Tons



Central Type,
10, 15 Tons

Some of the advanced design features that have made Curtis units so popular with the trade and the user in these larger models are:

- TIMKEN BEARINGS — LESS FRICTION — Easier adjustment.
- PRESSURE LUBRICATION — With low-pressure safety cut-out.
- SLOW-OPERATING SPEED — Economical — More capacity — Long Life.
- UNLOADED STARTING — 3-step capacity reduction

Complete range of condensers for any requirement.

With the broad Curtis line, you can handle all of the more profitable air conditioning and refrigeration installations. A limited number of franchises are open.

Curtis REFRIGERATION AIR CONDITIONING

Curtis

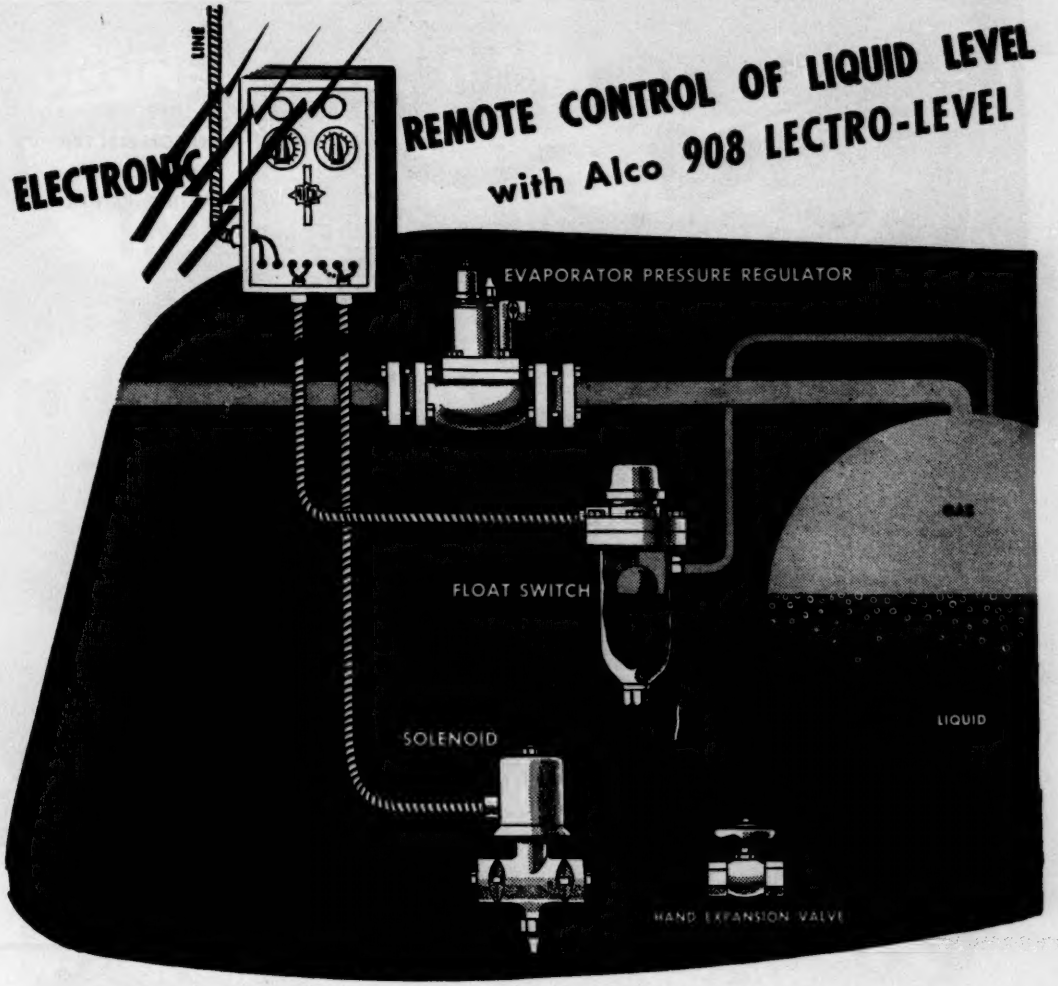
97 Years of Successful Manufacturing

Pin this to your letterhead and mail R-51-3

CURTIS REFRIGERATING MACHINE DIVISION
of Curtis Manufacturing Company
1999 Kienlen Ave., St. Louis 20, Mo.

I am interested in Curtis line. Please send me complete information.

ELECTRONIC REMOTE CONTROL OF LIQUID LEVEL with Alco 908 LECTRO-LEVEL



Accurate liquid level control for:

- full-flooded evaporators
- shell and tube coolers

FLEXIBLE—adjustable to a wide range of level changes due to load variation

REMOTE CONTROL—easy to set-control dials mounted conveniently in remote box

TIME-PROVEN—Lectro-Level has been successfully employed on critically flooded evaporators throughout the country for over *5 years*

We will be glad to send you complete technical and installation information. Write for Bulletin 908 or see your ALCO wholesaler.

ALCO

ALCO VALVE CO.

859 KINGSLAND AVE. • ST. LOUIS 5, MO.

Designers and Manufacturers of Thermostatic Expansion Valves; Evaporator Pressure Regulators; Solenoid Valves; Float Valves; Float Switches.

4764

Built to Last

"How Long Will It Last?" This question can be one of the most important points by which your product is judged. Further, the motor which you choose may be the determining factor.

Emerson-Electric Motors are *built* to last. Sound engineering and design principles, plus rugged construction have helped to build a reputation for long life into numerous nationally known products. These characteristics have also made them the standard for quiet, efficient, uniform power.

The wide acceptance of Emerson-Electric Motors by domestic, institutional and industrial consumers is based on a background of 60 years' experience. It's sales assurance to select motors with *lasting power.* Your inquiry is invited on this complete line of motors in the 1/20 to 5 h.p. range.

Write for these Emerson-Electric Motor Data Bulletins

Appliance and equipment manufacturers, with applications for motors of 1/20 to 5 h.p., can profitably use these reference guides. Specifications, construction and performance data are included for these motors:

- ☐ 142-A Capacitor-Start
- ☐ 142-B Split-Phase
- ☐ 142-C Integral
- ☐ 142-D Fan-Duty
- ☐ 142-E Oil-Burner
- ☐ 142-F Jet Pump
- ☐ 142-G Blower

The Emerson Electric Mfg. Co.
St. Louis 21, Mo.

EMERSON ELECTRIC
MOTORS • FANS APPLIANCES

BRUNNER SINCE 1906 **REFRIGERATION** helps you serve better

There are just two steps to closing more business

THE FIRST STEP IS—*use this coupon*

Just fill it in and mail it

We will know this is your request for a Brunner factory representative to stop in and go over the reasons why Brunner dealers find it easier to close business.

Name

Company

Address

City and State

With all the facts fresh in mind you will recognize the second step—recommend and install Brunner's from now on. With 69 models comprising a complete range of commercial capacities and types, a dependable source of supply and a known product with ready acceptance by your customers, selling obstacles are removed and you are on the way to bigger business. We will be looking for the coupon.

BRUNNER MANUFACTURING COMPANY
Utica 1, New York, U. S. A.

REFRIGERATION CONDENSING UNITS
...a size and type for every purpose

BRUNNER SINCE 1906

AIR AND WATER COOLED MODELS
¼ HP. to 75 HP.

BRUNNER

AIR CONDITIONING
Self Contained Units in 4 sizes: 3-5-7½ and 10 HP.
Remote Installation Types from 3 to 75 HP.

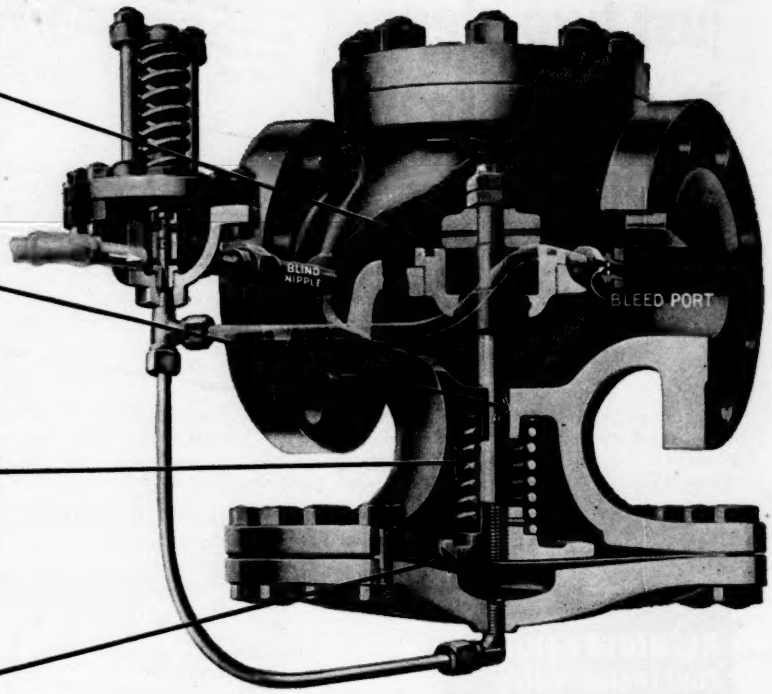
WHY Spence Regulators Outlast The Field

SECO METAL SEATS AND DISCS — Durable SECO Metal resists wiredrawing. More than *twenty years of experience* in thousands of installations has failed to produce a single case where SECO Metal has been cut by steam.

PACKLESS CONSTRUCTION — All Spence main valves and most pilots are built without stuffing boxes. This minimizes friction . . . eliminates much time-consuming maintenance.

SPRING OUT OF PATH OF STEAM — The spring in the Spence Regulator is out of the path of the steam or other fluid flowing through the valve. It operates at low unit stress for exceptionally long life.

LARGE BALANCED DIAPHRAGM—Spence metal diaphragms, under usual conditions, never require replacement. Spence Regulators have few moving parts and those few are ruggedly constructed and seldom require attention.



Spence Type EQ back pressure regulator-operation of main valve is controlled by a sensitive pilot to regulate the initial pressure. Same pilot is used with all sizes of main valves.

The features shown above explain why you profit on every important count with Spence Pressure and Temperature Regulators.

Learn more about these and many other advantages of Spence Regulators by sending for Bulletin 350.

DURABILITY — Spence Regulators perform dependably year after year.

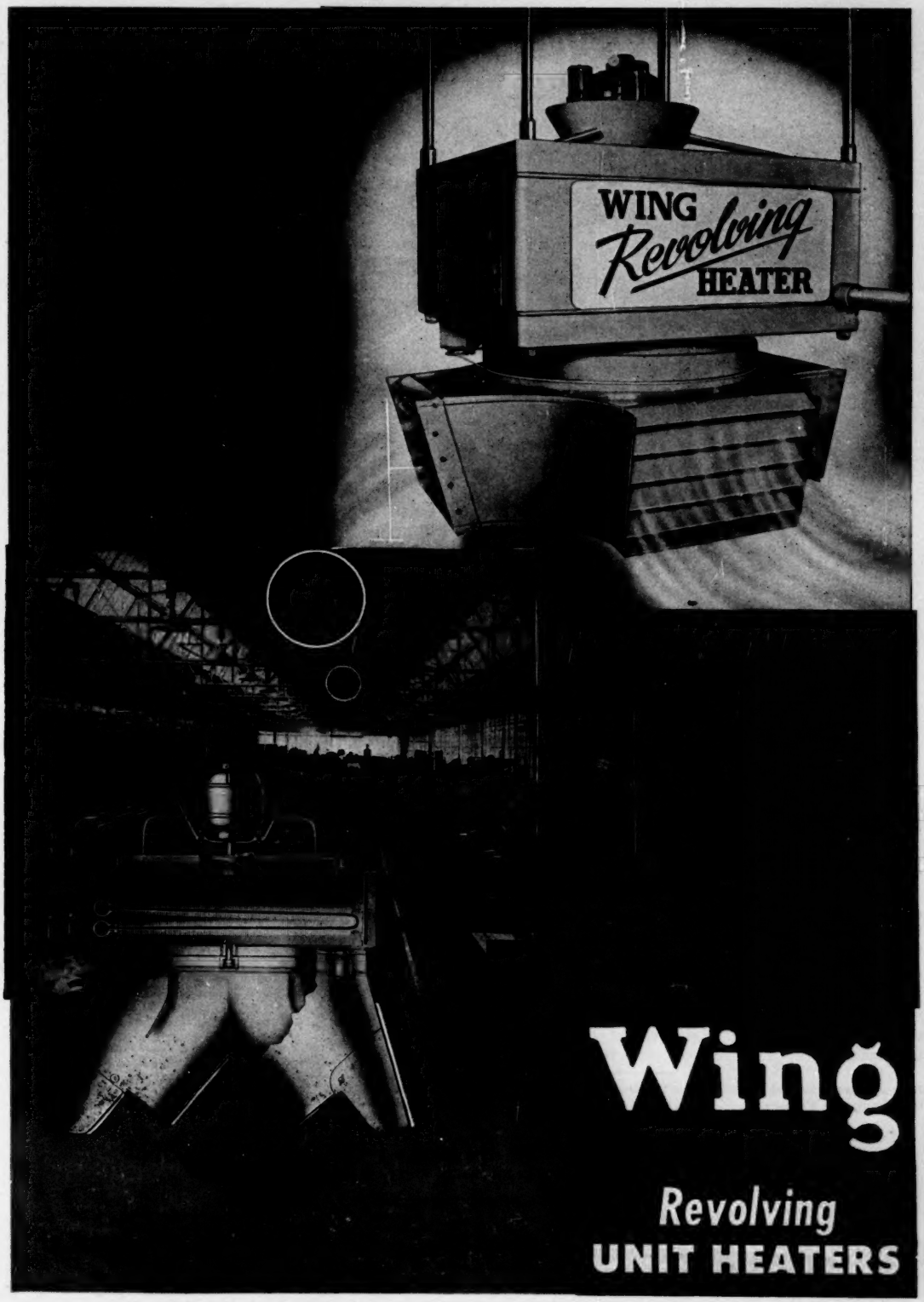
ACCURACY — You can be sure of accurate control for the life of the regulator.

MAINTENANCE — You don't need expensive repairs or special maintenance. That means less down-time, less time and money wasted on replacement of parts.

BB-110

SPENCE ENGINEERING COMPANY, INC.
WALDEN, NEW YORK

Spence


WING
Revolving
HEATER
Wing
Revolving
UNIT HEATERS

"We can't go wrong—it's **radiant heated**"

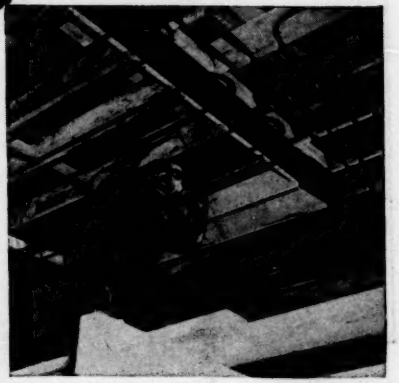
Steel pipe is <u>first choice</u> for radiant heating

Among the thrills that come to all of us but "once in a lifetime", who does not remember that first Christmas together . . . or the baby's first birthday cake . . . or the first brand-new, shining car?

But the biggest thrill of them all came when, hand in hand, we stood before that just purchased home-of-our-own!

Young folks today (and older ones, too) face the same moments of decision that we did when buying or building a new home. But, when they find their dream house is to have Radiant Panel Heating, they know it was designed by those acquainted with the latest in home building ideas. Radiant Heating becomes a symbol of sound value!

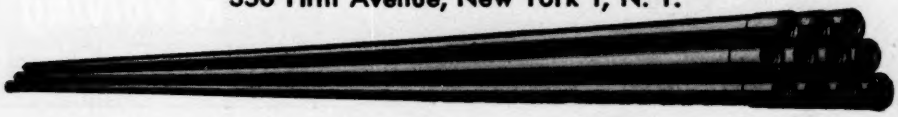
And when the Radiant Panel Heating coils are of Steel Pipe, success is assured. For Steel Pipe has all the desirable characteristics of durability, weldability, formability, and maximum economy . . . proved through more than 60 years of service in domestic heating systems!



Steel Pipe coils for Radiant Panel systems may be used with equal effectiveness in floor, wall, or, as shown above, ceiling installations.

A 48-page color booklet "Radiant Panel Heating with Steel Pipe" is yours for the asking. Write for it . . . it's free.

COMMITTEE ON STEEL PIPE RESEARCH
AMERICAN IRON AND STEEL INSTITUTE
350 Fifth Avenue, New York 1, N. Y.



MODERN

Miracle Drugs

ARE MADE HERE

The Upjohn Co., Portage Road Plant, Kalamazoo, Mich. • *The Austin Company—Engineers and Builders*

UPJOHN'S MAMMOTH NEW PLANT

equipped for clean air by AAF!

THE COMPLETION of Upjohn's superb new plant means better health . . . more active lives for millions of Americans. Here, no expense or engineering talent was spared to obtain the most modern facilities for controlled pharmaceutical manufacturing. Since modern medicines . . . particularly anti-biotics and other sterile solutions . . . exact unusual requisites for sterility and plant hygiene even the air had to be hygienically *clean*.

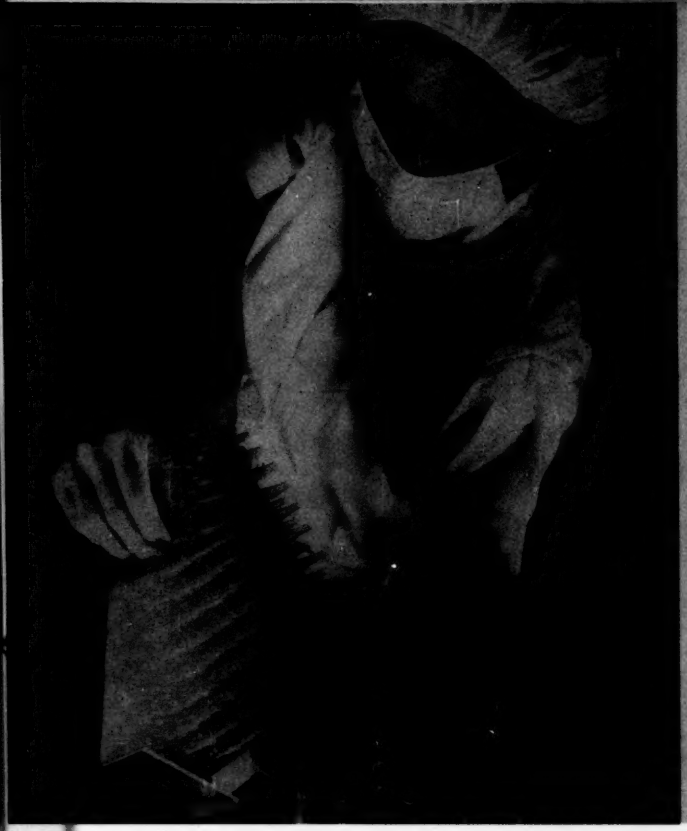
American Air Filter products were selected to perform this service for the entire plant. Nine distinct types of AAF air filters and dynamic precipitators were used to supply clean air to the many operations and control the dust created by some of them. Though the problems involved both degree of air cleanliness and a wide spread in required volumes—AAF's complete line provided efficient and practical solutions in every instance.

For specific applications see the following pages . . .

American Air Filter

COMPANY, INC.

215 Central Ave., Louisville 8, Ky. • **In Canada: Darling Bros., Ltd. Montreal, P. Q.**



91 AAF UNITS

Supply More Than 1,000,000 c.f.m. . . . of Clean Air

MODERN pharmaceutical manufacturing creates highly diversified problems of air care. These range from maintaining sterile labortory conditions to eliminating dust in maintenance shops. Illustrated are a few operations at the new Portage Road plant serviced by several types of AAF air filtering products. Upjohn's selection was based on their many years of experience with American Air Filter equipment.

AIR HYGIENE PROBLEMS

solved by nine types of AAF products

FILTER TYPES AND CAPACITIES

Upjohn Portage Road Plant

TYPE	NO. OF UNITS	TOTAL CAPACITIES cfm
AAF Electro-Matic	7	83,850
AAF Electro-Airmat	1	2,000
AAF Electro-PL	1	2,000
AAF Multi-Duty	53	830,570
AAF Multi-Panel	1	15,000
AAF Roto-Clone Type D	4	19,470
AAF Roto-Clone Type W	23	96,920
AAF Dust Box	1	1,200
TOTAL	91	1,051,010

AAF's Amer-glas disposable filter is used extensively throughout the plant.

● Bacterial filtration processes require exceptionally sterile conditions. Here, AAF's Electro-Matic supplies *super-clean* air by highest cleaning efficiency.

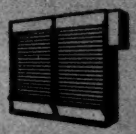
● Freeze Dry Area. Another operation requiring highly sterile conditions, as seen by visitors through observation panels. Again Electro-Matics supply the *super-clean* air required.

● Coating Pan battery. AAF's Type W Roto-Clone controls this dust source. These hydrostatic precipitators collect dust and store it in sludge form within self-contained units.

Upjohn's new Portage Road plant occupies approximately 33.2 acres of floor space. Main manufacturing building is 875 feet wide and 1120 feet long.

Antibiotics building at far right.

● Counting and Packaging. Air for this operation is filtered by AAF's Multi-Duty. A total of fifty-three Multi-Duty units are installed at the new Portage Road plant.



● Spray Drying. AAF's PL-24 and Amer-glas filters make an efficient team to eliminate airborne particles.

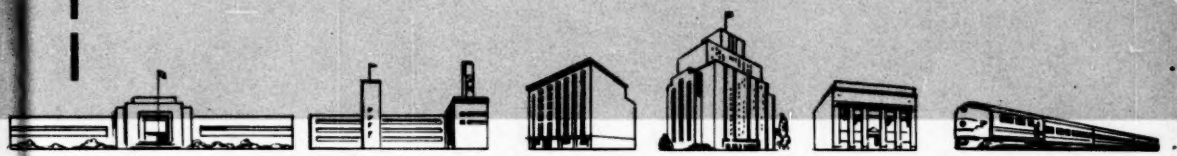
● Conveyors and transfer points. American Air Filter's Type W Roto-Clones provide complete collection of finely divided material at the source.

today's best buy is better air!

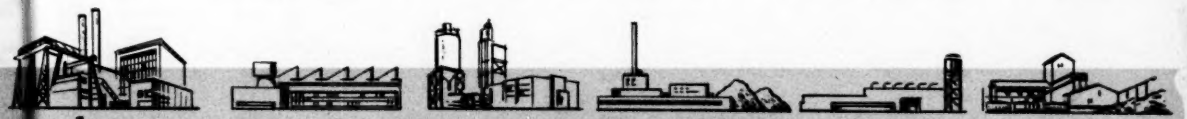
THERE IS ONLY ONE COMPLETE LINE OF AIR CLEANING EQUIPMENT...AAF!

For thirty years American Air Filter has pioneered air filtration and dust control. Today its highly diversified products serve industry and commerce throughout the world.

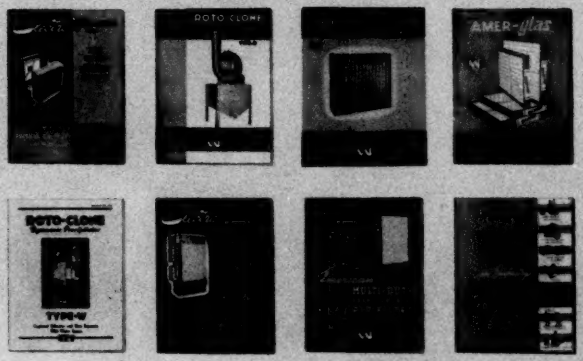
AAF's engineering research in the control of air pollution is continually developing new methods, new products and solutions to new problems. The engineering staff is recognized as having the outstanding experience available in this field. If *you* have a problem requiring *clean air* call your AAF representative. He will provide a practical solution.



PHARMACEUTICALS • TEXTILE MILLS • DEPARTMENT STORES • HOTELS • BANKS • TRANSPORTATION
FOUNDRYS • METAL WORKING • CHEMICALS • PAPER MILLS • INDUSTRIAL FINISHING • MINING



These are a few of many AAF Engineering Bulletins covering all phases of air cleaning and the complete line of AAF products. Bulletins will be mailed on written request.



AAF

American Air Filter

COMPANY, INC.

215 Central Avenue, Louisville 8, Ky. • In Canada: Darling Brothers, Ltd., Montreal, P. Q.

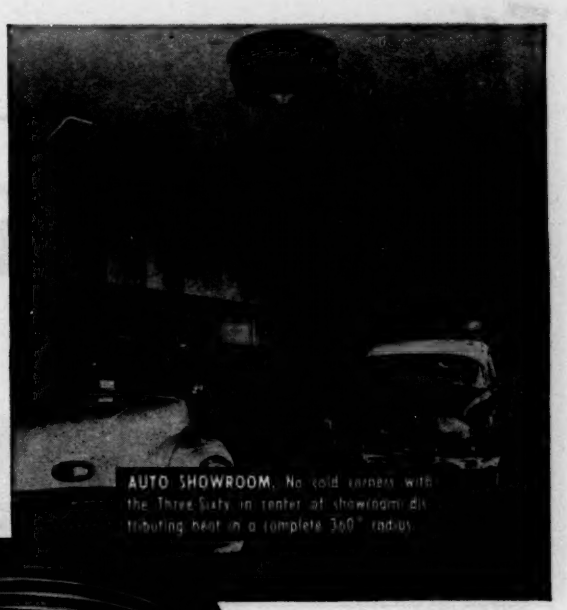
STEP AHEAD WITH THE *Norman Three-Sixty

THE FINEST IN OVERHEAD GAS HEATING FOR

- **Stores**
- **Shoppes**
- **Gas stations**
- **Offices**
- **Factories**
- **Small buildings**
- **101 other overhead heating applications**

The new circular design Norman Three-Sixty assures better, more comfortable circulation of heat over entire area . . . more attractive appearance for modern stores . . . simplified installations and servicing . . . countless other advantages never before possible with a suspended heater. Send for new illustrated folder just off the press. Mail coupon today to receive your free copy by return mail.

Copyright 1951 by Norman Products Company, Columbus, Ohio
* Trade Mark Registered

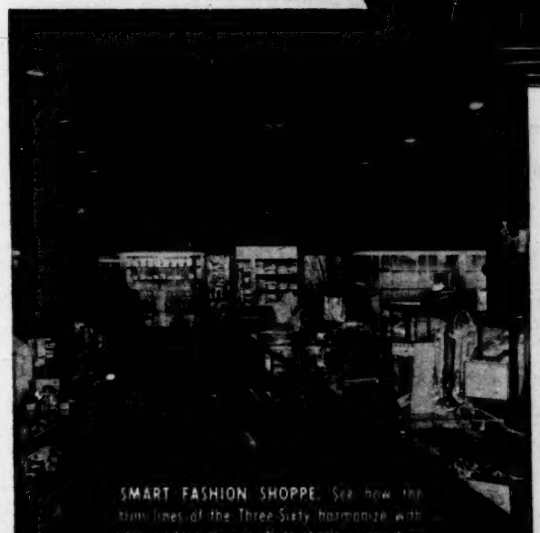


AUTO SHOWROOM. No cold corners with the Three-Sixty in center of showroom distributing heat in a complete 360° radius.

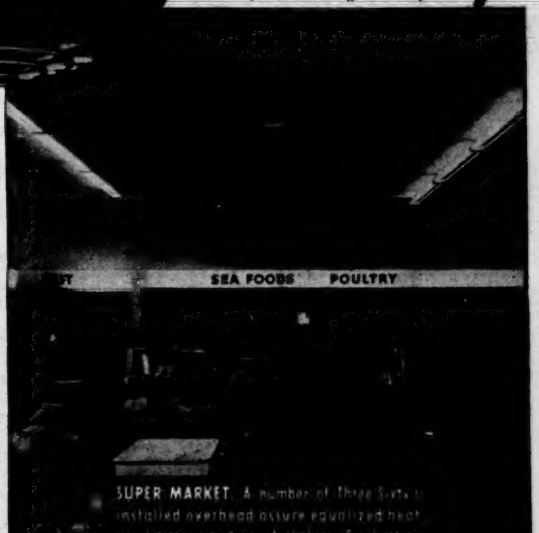
FORCED CONVECTION OVERHEAD GAS HEATER DISTRIBUTES HEAT HORIZONTALLY IN 360° RADIUS

*Norman Three-Sixty

(U. S. Patent #2519496)



SMART FASHION SHOPPE. See how the trim lines of the Three-Sixty harmonize with this modern shoppe. Note shallow mounting and depth.



SUPER MARKET. A number of Three-Sixty's installed overhead assure equalized heat circulation over tops of shelves. Combustion products are under pressure.

STEP AHEAD WITH THE NORMAN SOUTHERNER FOR LOW COST, SPACE-SAVING INSTALLATIONS

The quality-built Norman Southerner is the original compact horizontally designed forced-air gas furnace. Fits in attic, basement, closet, utility room, under floor. Guaranteed for 10 years. Thousands in use. 4 sizes, 40,000 BTU to 100,000 BTU.

NORMAN PRODUCTS CO., Dept. B-4
1146 Chesapeake Ave., Columbus 12, Ohio

Please rush literature giving complete details and specifications on:

☐ **Norman Three-Sixty** ☐ **Norman Southerner**

NAME _____

FIRM NAME _____

ADDRESS _____

CITY _____ **ZONE** ____ **STATE** _____

It's new... so it's MARLEY!

MARLEY
Laminated Fan Cylinder
PATENT APPLIED FOR
THE MARLEY CO., INC.
KANSAS CITY, KANSAS

Cooling Tower Fan Cylinders

that are entirely new, distinctive in design . . . are another major addition to Marley's long list of achievements in cooling tower advancement.

Laminated Fan Cylinders are the sturdiest ever applied to cooling towers. Built entirely of overlapping layers of redwood boards, they are structurally strong . . . uniformly strong at every point. No metal shape rings or clamp strips are needed; there is nothing to corrode, loosen or vibrate. Laminated Fan Cylinders are built of the same material as the towers they serve . . . built to last as long.

MODERNIZE ANY LARGE INDUCED DRAFT TOWER

Laminated Fan Cylinders will reduce maintenance time and upkeep expense on *any* large cooling tower. No painting, no replacing rusted metal parts — you check fan cylinders off the maintenance list when you install modern Laminated Fan Cylinders. Engineers have ordered many of these fan cylinders for replacement since Marley recently made them available.

also producers of
DOUBLE-FLOW TOWERS
CONVENTIONAL TOWERS
DRICOOLERS
NATURAL DRAFT TOWERS
SPRAY NOZZLES

For detailed information, call your Marley representative or write for LP-30a.

The Marley Company, Inc.
KANSAS CITY 15, KANSAS

MARLEY

perfected engineering

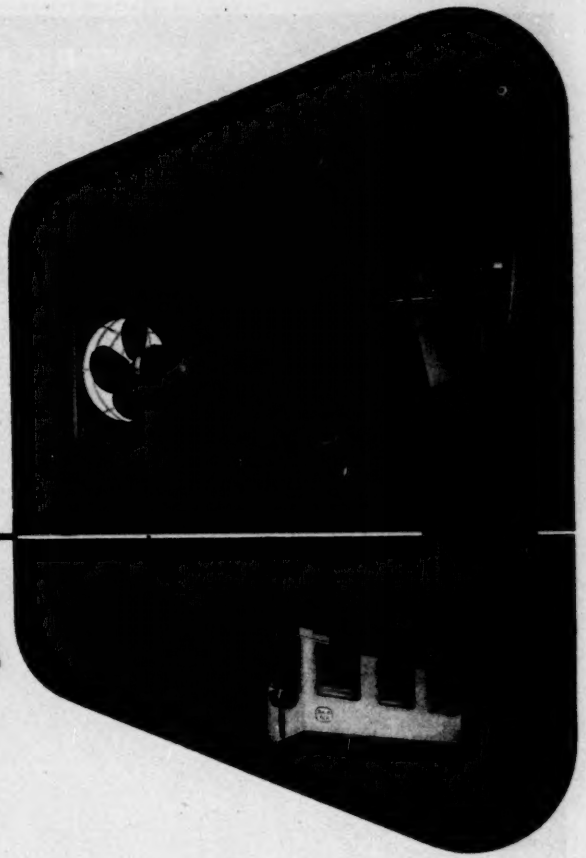
precision manufacture

certified ratings

nyb

responsible guarantees

of dependable performance



Wherever air is handled mechanically, whether for ventilation heating or process, the name New York Blower enjoys an enviable reputation. ***nyb*** on a product means that the engineering knowledge acquired through sixty-one years of manufacturing experience and development is built into it.

Are you using AIR to the best advantage in your production methods to cut costs, increase efficiency, reduce absenteeism, safeguard health, bring comfort to workers...or applying it to process control for precision manufacture and more uniform products?

When working on your air handling problems, consult the ***nyb*** representative nearest you in our nationwide service.

write for bulletins

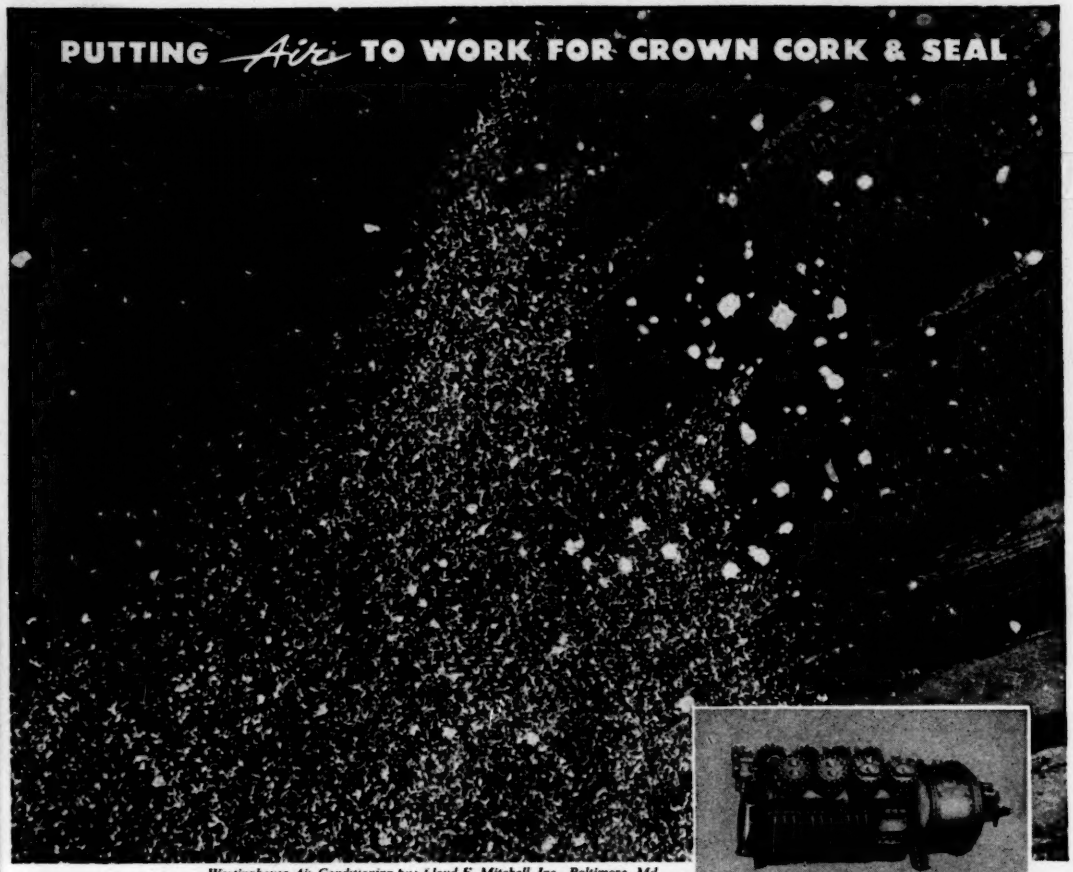
nyb

THE NEW YORK BLOWER COMPANY

GENERAL OFFICES • 32nd STREET & SHIELDS AVENUE • CHICAGO - 16

FACTORIES AT LAPORTE, INDIANA AND CHICAGO, ILLINOIS

PUTTING *Air* TO WORK FOR CROWN CORK & SEAL



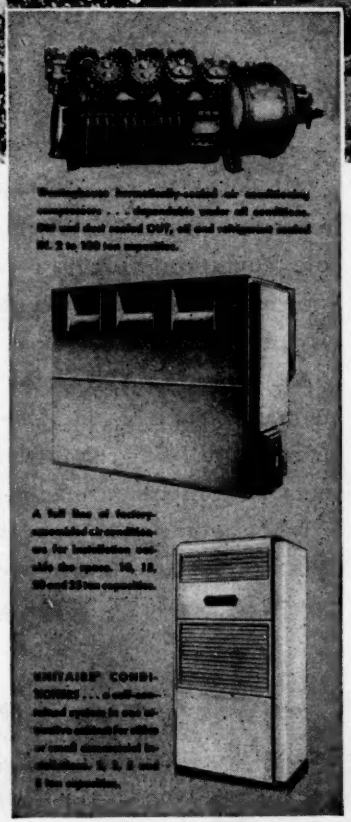
Westinghouse Air Conditioning by: Lloyd E. Mitchell, Inc., Baltimore, Md.

COOL AIR SOLVES A CORKING PROBLEM

Over and over, down a 50-foot revolving cylinder, millions of adhesive-coated cork particles cascade through chilled air. Warm and sticky, these particles could gum up the works in nothing flat. But cooled, they flow like salt from a shaker into machines that produce the familiar disc found the world over in beverage bottle caps.

Westinghouse Air Conditioning helps Crown Cork & Seal here . . . also solves cork storage problems involving temperature and humidity control . . . adds a dividend by increasing employe efficiency in packing rooms.

Westinghouse can *put air to work* for you, too . . . with air conditioning, air handling and air cleaning equipment. Call the Westinghouse Air Conditioning Distributor in the classified directory, or write Westinghouse Electric Corp., Air Conditioning Division, Hyde Park, Boston 36, Mass.



YOU CAN BE SURE...IF IT'S

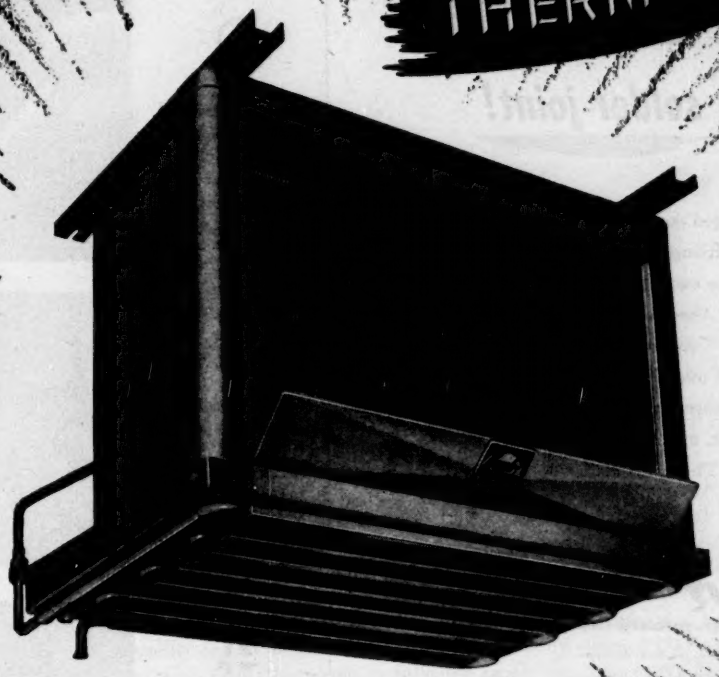
Westinghouse

J-80215

Here it is!

Bush

THERM-O-CYCLE



The ultimate in hot gas defrosting

Therm-o-cycle is a simple refrigeration system using room air passed over a re-evaporator coil to furnish the heat required for defrosting. Dependable, automatic and trouble-free Therm-o-cycle has been proven in thousands of fixture installations the world over. Now, this system is available for larger commercial installations.

Write for Bulletin No. 525 which gives complete specifications and instructions.

Buy the Best — and the Best is Bush

Bush Manufacturing Co.

WEST HARTFORD 10, CONNECTICUT

THESE FIVE SIMPLE STEPS

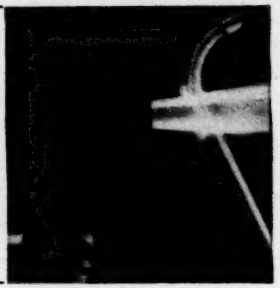
make a solder-joint!

Properly soldered connections between Chase Solder-Joint Fittings and Chase Copper Water Tube are exceptionally strong and pressure-tight. Assemblies of ½" Chase Copper Water Tube and Solder-Joint fittings have withstood over 3,400 pounds pull, and 5,000 pounds water pressure per square inch. Jobs last longer, and look better, with Chase Copper Water Tube and Solder-Joint Fittings.

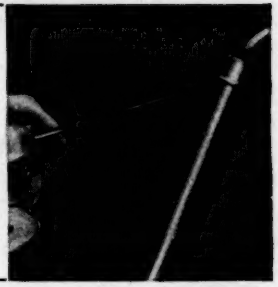
1 Polish the outside of the tube and inside of the fitting with No. 00 steel wool or fine grade sand cloth.

2 Apply thin coat of flux to tube and inside of fitting. Place fitting on tube and remove excess flux.

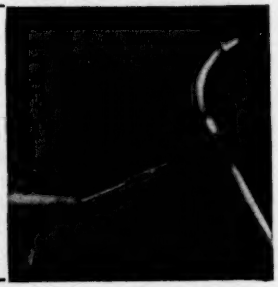
3 Heat joint evenly with a blow-torch. Remove flame and apply solder to joint. Solder will melt from wire at correct temperature.



4 Capillary attraction draws solder into joint. When solder shows around edge of fitting, connection is completed.



5 Remove excess solder with a brush. Do not place any strain on the joint until it has cooled.



Chase BRASS & COPPER

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

• *The Nation's Headquarters for Brass & Copper*

Albany†	Cleveland	Kansas City, Mo.	New York	San Francisco
Atlanta	Dallas	Los Angeles	Philadelphia	Seattle
Baltimore	Denver†	Milwaukee	Pittsburgh	Waterbury
Boston	Detroit	Minneapolis	Providence	
Chicago	Houston†	Newark	Rochester†	(† sales office only)
Cincinnati	Indianapolis	New Orleans	St. Louis	

Send the coupon for folders on Making Solder-Joint, and Flared connections with Chase Copper Water Tube.

Chase Brass & Copper Co.
Waterbury 20, Conn.

Dept. HV-751

Please send me free folders on How To Make Solder-Joint and Flared connections.

Name_____

Position_____

Firm_____

Address_____

City_____ State_____

Include DOREX AIR RECOVERY in your air conditioning or heating plans

Fresh air isn't "for free" in an air conditioning system. It costs plenty to heat or cool. So the secret of economy is: reduce the amount of fresh air that has to be brought in from the outside to maintain air quality inside. Dorex Air Recovery does just that—gives you a real bargain by maintaining fresh air quality with *as little as one-third the normal intake of outside air!*

Dorex Air Recovery "manufactures" *fresh* air from *used* air by removing all odorous and gaseous impurities. The heart of the matter is the remarkable Dorex C Cell with its beds of activated carbon—the most effective air purifier known.

Since with Dorex Air Recovery you have less new air to heat or cool, you need less heating and cooling capacity. This saves both critical material and money—some $400 for every $100 invested in Dorex. And every $1 spent for Dorex maintenance should return a $4 saving in operating costs.

The effectiveness and economy of Dorex Air Recovery have been proved by more than 7,000 installations in the past 20 years. To find out more about Dorex, mail the coupon today.

TRADE MARK "DOREX" REG. U. S. PAT. OFF.

DOREX
Air Recovery

W. B. CONNOR ENGINEERING CORP.
Danbury, Connecticut
Air Diffusion • Air Purification • Air Recovery
In Canada: Douglas Engineering Co., Ltd.,
190 Murray Street, Montreal 3, P. Q.

W. B. CONNOR ENGINEERING CORP.
Dept. B-71, Danbury, Connecticut

Please send me, without obligation, full information on Dorex Air Recovery

Name .....
Position .....
Company .....
Street .....
City ..... **Zone** ..... **State** .....

Permanent Valves and Traps for a Permanent Building . . .

Federal Office Building
NASHVILLE, TENNESSEE

Architects — Engineers:
Marr & Holman, Nashville

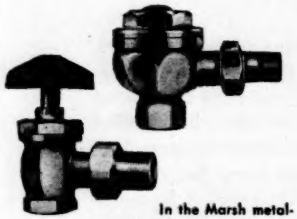
Plumbing and Air Conditioning Contractors:
J. M. Gallagher Company, Nashville

Impressive even in the vast building program of the Public Buildings Administration is this big Federal Office Building at Nashville, Tenn.

Buildings like this are built to function faultlessly, with a minimum maintenance, for a long, long time to come. This is also the distinguishing characteristic of Marsh Heating Specialties. So the choice of Marsh Valves and Traps for this massive structure is entirely logical.

At the right of the illustration you see a part of the stately Nashville Post Office. Erected in the late thirties and also equipped with Marsh Heating Specialties, it stands as another example of a permanent building provided with permanent heating equipment.

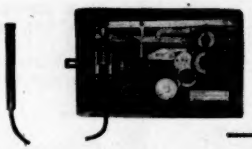
Indeed this respect for Marsh quality is demonstrated on a nation-wide scale in the selection and specification of Marsh valves, traps, vents and controls for finer buildings, large and small, in every part of America. Use Marsh equipment on your next job and you will see in its advanced design and trouble-free service why it is the first choice of the most discriminating heating men.



In the Marsh metal-to-metal seal you have the finest packless valve construction and in the Marsh radiator trap you have the most efficient team-mate for it. This combination was widely used in the Nashville Federal Office Building.

This Marsh float and thermostatic trap is typical of a wide line of Marsh traps for all services. Many are installed at Nashville.

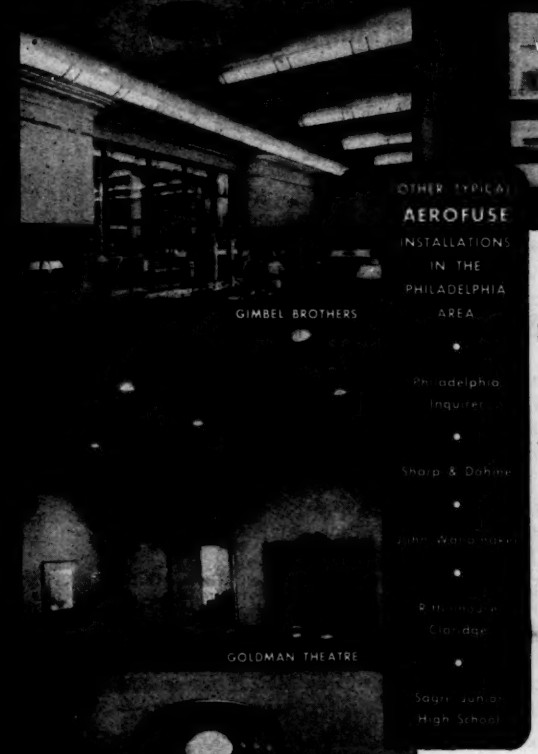
MARSH HEATING EQUIPMENT CO. *Sales affiliate of Jas. P. Marsh Corporation*
Dept. U, Skokie, Ill.



BIG FUEL SAVINGS — WITH HEAT REGULATION IN STEP WITH THE WEATHER.
Maximum comfort with minimum heating costs . . . that is what the Marsh-Tritrol accomplishes by controlling heat in step with outside weather. Ask for facts.

MARSH *Heating Specialties* SINCE 1865

Aerofuse



OTHER TYPICAL
AEROFUSE
INSTALLATIONS
IN THE
PHILADELPHIA
AREA

- Philadelphia Inquirer
- Sharp & Dohme
- John Wanamaker
- Philadelphia Clearing House
- Saul Junior High School

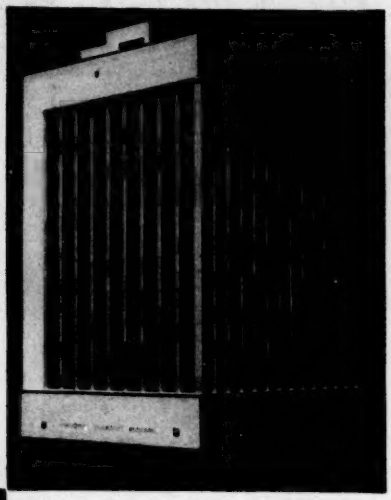
CENTRAL PENN NATIONAL BANK

Whether you shop, work or relax in air conditioned comfort in the Quaker City, there's a good chance that Aerofuse Diffusers are there, too. For, as in other cities the country over, important air conditioning jobs in historic Philadelphia are Aerofuse jobs. In department stores, theatres, banks, offices, etc.—where conditions and requirements vary widely—the men responsible for these installations know from experience that when they select diffusers from the Aerofuse line they will meet the most rigid specifications of performance and appearance . . . *at the vital point of air delivery.*

Send for your copy of Aerofuse Catalog 104 . . . complete information, size selection data, engineering details.

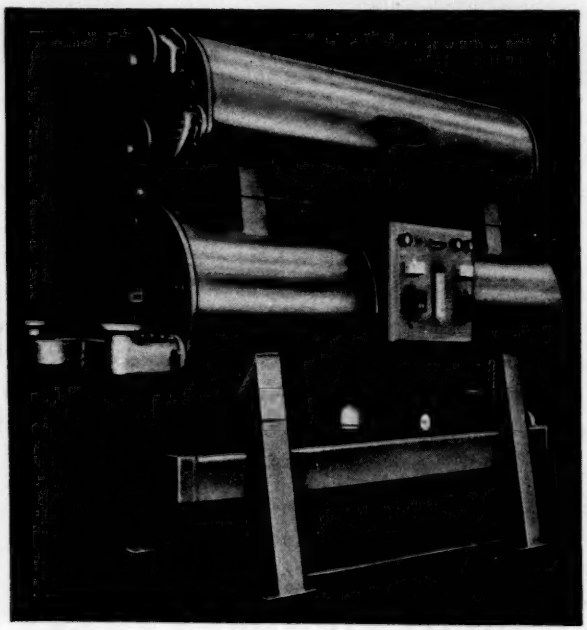
TUTTLE & BAILEY inc

NEW BRITAIN, CONNECTICUT



FOR ROOF LOCATIONS

what refrigerating machinery is best?



They're putting the mechanical equipment on the roof nowadays. And for good reason. The move saves space, centralizes equipment, makes basements rentable.

The trend calls for compact lightweight air conditioning equipment like the new Carrier Absorption Machine.

It's smaller and weighs less per ton of capacity than any other refrigerating machine you can buy. Noise and vibration problems are out — because there are no major moving parts — just a small solution pump.

This Carrier Absorption Machine operates at a minimum cost, too. It uses steam (often idle capacity or waste steam) to produce cooling. The steam rate is less than 20 pounds per hour per ton of refrigeration. It automatically adjusts itself to partial loads — down to 10% of capacity, with sustained efficiency.

Send for our interesting folder describing new, lightweight 115 to 350 ton capacity refrigerating machines. Carrier Corporation, Syracuse 1, N. Y.

Top right: **Employers' Insurance Building, Dallas.**
Top left: **Self Memorial Hospital, Greenwood, S. C.**

Carrier

Air Conditioning Refrigeration Industrial Heating

NOW! 5 MINUTES TO PREPARE YOUR BID

for these High Profit Bunker Oil Installations!

More and more engineers are specifying Thermal Electric for bunker oil heating — are you ready to land these profitable contracts?

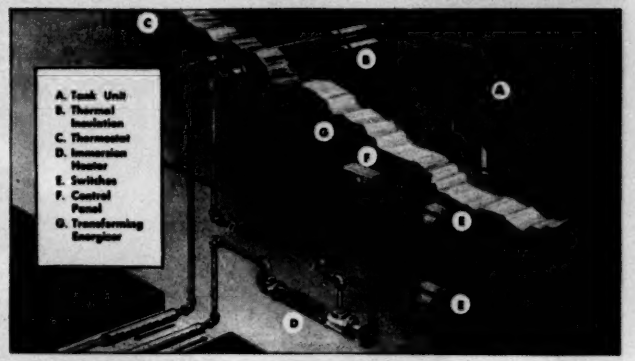
You will be ready if you'll send in NOW for easy-to-use Thermal Electric calculation forms. Sitting at your own desk, with no other material than these forms and the specs for the job, you can estimate all your bunker oil heating equipment costs in *five minutes!*

You do not have to consult us before bidding. Just fill in a few blanks with data such as pipe length and number of burners. This *automatically* gives you your equipment list and costs.

For special cases, we furnish another handy form ("Quotation Request") which you fill out and mail to us. We send you back your Thermal Electric equipment list and prices.

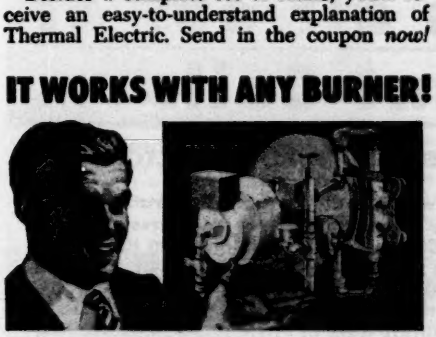
Get these forms and keep them *on hand.* They'll save you time and work. You'll be able to submit fast, accurate, safe bids, and land profitable Thermal Electric contracts.

Besides a complete set of forms, you'll receive an easy-to-understand explanation of Thermal Electric. Send in the coupon *now!*



THIS IS THERMAL ELECTRIC: Thermal Electric is a completely automatic, all-electric system of transporting #6 bunker oil from unheated storage to the oil burner(s) at 120°F. The Transforming Energizer passes safe, low-voltage current through the pipes carrying the oil. The oil is heated evenly over the entire system—no hotspots or coking. The system can be shut down without draining. Flip the switch—the solidified fuel melts and flows, with no blow-torches!

IT WORKS WITH ANY BURNER!



Outstanding Thermal Electric installations have been made in combination with these burners:

Ray • York • Petro • Johnson • Todd Enterprise • Iron Fireman • Preferred • Gilbarco Superior • Ames • Cyclotherm • Rexoil • Hauck Cleaver-Brooks • North American • Ace Indiana • and others.

Send Coupon Now!

THERMAL ELECTRIC EYE OPENERS

Did you know—

—that with Thermal Electric, recirculation is completely eliminated? Equipment costs are cut. Gone are the headaches of installing a lot of complicated gadgetry requiring repeated service calls.

—that with Thermal Electric there is no need for constant or cycle operation? Multiple suction lines are eliminated. Labor and equipment costs are reduced.

—that Thermal Electric is 100% automatic? All-electric operation eliminates maintenance headaches of steam or hot water systems, eliminates service problems for you.

—that with Thermal Electric remote pump sets are unnecessary in most cases? More costs cut!

—that Thermal Electric removes fuel from *unheated* storage without auxiliary heat? The Tank Unit which does this is simple to install, eliminates the hazards of oil leaking into steam or hot water systems.

—that Thermal Electric *guarantees* to (1) remove #6 oil from unheated storage and (2) deliver it to the burner at 120° F.?

—that more and more engineers are specifying Thermal Electric? Are YOU ready to bid?

Thermal Electric Fluid Systems inc.

Fluid Systems Inc., 1881 Dixwell Ave., New Haven 14, Conn.

Please send complete set of Thermal Electric cost estimating forms, plus free descriptive literature to—

Name _____

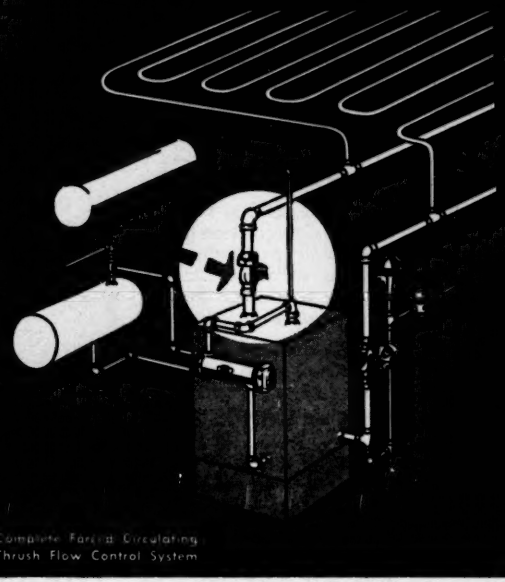
Address _____

City _____ *State* _____

HOVC 1

Proved

in thousands of successful installations



Complete Forced Circulating Thrush Flow Control System

No. 201 Thrush Radiant Heat Control

No. 200 Relay Transformer

Horizontal Thrush Water Circulator

FORCED CIRCULATING FLOW CONTROL HOT WATER HEAT

Keeps air out of Radiant Coils...

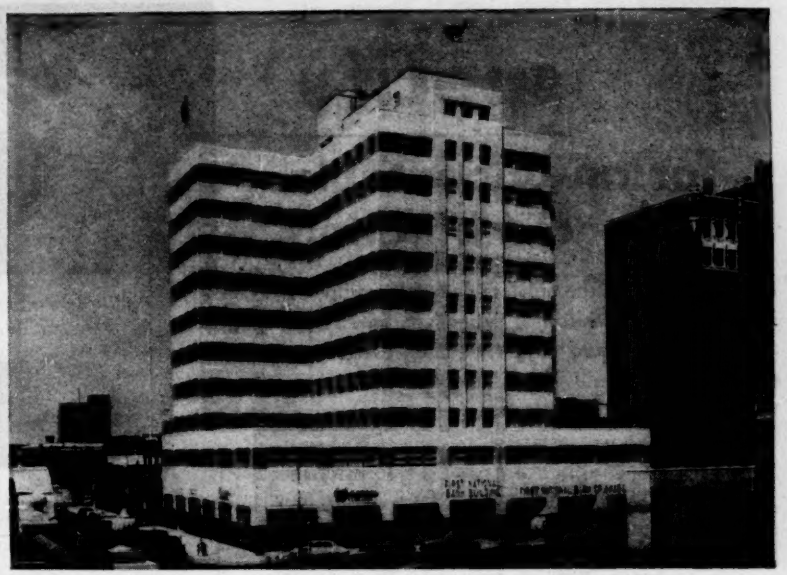
RADIATORS, BASEBOARD AND CONVECTORS

KEEP HOT water heating systems operating at the peak of efficiency by eliminating air at its source. The improved Thrush Flow Control Valve vents air from the boiler. It is really two valves for the price of one because it provides both flow control and air elimination without any extra air tube fitting. Made in the vertical type shown here and also in the angle type to facilitate ease of installation under varying conditions. No other flow control valve has all these features. If you want to give your customers the best in modern radiant hot water heat, specify Thrush Forced Circulating Flow Control System with these valves.

Ask your wholesaler or write Dept. D-7 for bulletin.

H.A. Thrush AND COMPANY
PERU • INDIANA

PERSONAL WEATHER CONTROL AIR CONDITIONING

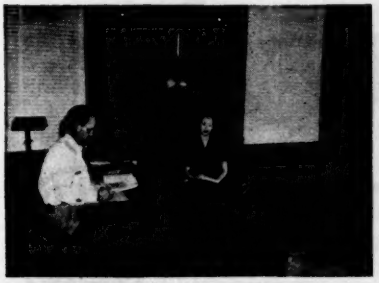


YEAR 'ROUND AIR CONDITIONING for new First National Bank Building of Amarillo, Texas, is provided by G-E Personal Weather Control. G-E Central Plant units and individually-controlled room units are used. Architect and engineer: Bank Building & Equipment Corporation of America, St. Louis, Mo. Air conditioning contractor: Sebastian-Fulcher Air Conditioning Company, Austin, Texas.

In Amarillo's First National Bank Building...

SINGLE G-E SYSTEM AIR CONDITIONS BANK, SHOPS, OFFICES

FIRST-FLOOR BANK SPACE is cooled in summer and heated in winter by remotely located G-E central plant units. They're quiet, long-lasting, and give top performance under all conditions.



NO COMPRESSOR IN SMALL ROOM UNITS used in individual offices—just quiet fans, filter, coil and motor. Room occupants set temperature and fresh air supply they want without disturbing others. Units are supplied with handsome cabinets (above) or are concealed in walls. Windows are never blocked.

TO PROVIDE AT LOW COST the right air conditioning for such varying applications as a bank, several shops, and eight floors of offices, top-ranking Bank Building & Equipment Corporation of America specified the extremely flexible G-E Personal Weather Control System for this beautiful new Amarillo building, tallest structure of its kind in the Texas Panhandle.

In the bank, the shops, the basement, and the upper-floor interior zones not exposed to outdoor climate changes, heavy-duty G-E Central Plant units are used with standard ductwork. G. E.'s wide range of sizes and shapes makes the most of available space.

TO INCREASE THE VALUE OF OFFICE SPACE...famous G-E Personal Weather Control cools and heats outside offices with 300 tenant-controlled room units. Each room occupant gets the weather he wants—without disturbing other rooms. These units are supplied with hot or chilled water according to season from the same plant that services the large-space units. Fresh air is supplied through space-saving, cost-cutting small-size ducts.

"WE CHOSE G-E equipment because we knew it would produce the results desired," says J. B. Gander, president, Bank Building & Equipment Corporation. "These results have been achieved ...the system has proved to be very adaptable and economical."

Building value increases materially when you install G-E Air Conditioning. That is why G-E Systems are installed in 10 Sheraton Hotels...the prominent new 575 Madison Avenue Building in New York City...and other leading multi-room buildings all over the United States.

GENERAL ELECTRIC

FREE DATA to architects, engineers, builders, contractors, and building owners.

General Electric Company, Air Conditioning Division, Sec. HV-10, Bloomfield, N. J.

Please send me, without obligation, detailed information on G-E Air Conditioning Systems.

NAME.....

COMPANY.....

ADDRESS.....

CITY.....ZONE.....STATE.....

specify

for an unbeatable combination

Acme can furnish the unbeatable combination for industrial liquid chilling. When you specify an Acme Dry-Ex liquid chiller, heat exchanger, or oil separator, you'll get a flexible combination with many years of low cost, trouble free service.

ACME CONDENSERS

Offered in Shell and Coil and Shell and Tube designs, the ACME line of condensers is very complete — more than 120 standard sizes are offered for use with Freon, plus seven sizes in Model SC Shell and Finned Coil, with twelve additional sizes in Model J Shell and Tube Condensers. Both are designed for Freon 12 or Freon 22 Refrigerant. ACME Condensers are inexpensive, have drainable coils, are easy to clean and are compact, sturdily built and extremely efficient.

ACME HEAT EXCHANGERS

Available in 16 standard sizes, in capacities from ½ to 180 tons, ACME Heat Exchangers increase compressor capacity, prevent flash gas in liquid line, eliminate expansion valve vibration or chattering and offer true counter-flow operation. Model H has shell and coil construction. Also available in "U tube" bundle construction. ACME Heat Exchangers offer a practical solution when compressor capacity is on the border line for load requirements.

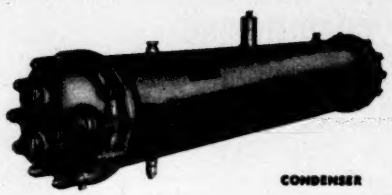
ACME OIL SEPARATORS

Are offered in a complete range of sizes, are economical and efficient to operate, easy to install and offer positive oil separation. Offered in a complete range of sizes, they are scientifically engineered for use with Ammonia or Freon. Series F Units have a central mounting strap and may be mounted directly on the Compressor base. Series FK and AK Models have a support bracket welded to the top.

ACME DRY-EX* WATER COOLERS

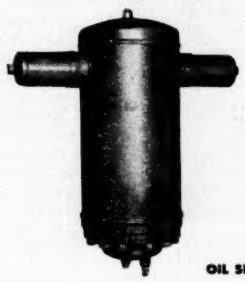
Designed to meet an extensive variety of either commercial or industrial applications, ACME DRY-EX Water Coolers are offered in more than 700 combinations of refrigerant heads baffle spacings and tube lengths. ACME Straight through tube construction permits the refrigerant circuit to be increased twice as frequently as in the "U tube" design. Baffles have a tighter fit with the shell and with the tube, and straight through tubes can easily and economically be replaced in the field.

ACME ALSO MANUFACTURES: *Freon Condensers—Ammonia Condensers—Blo-Cold* Industrial Unit Coolers — Evaporative Condensers — Liquid Receivers — Pipe Coils — Shell and Tube Condensers — Shell and Coil Condensers — Heat Exchangers — Flow-Cold* Liquid Chillers.*

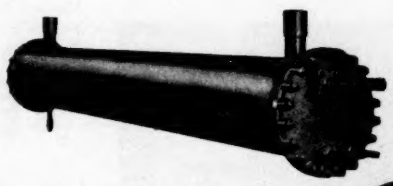


CONDENSER

HEAT EXCHANGER



OIL SEPARATOR



WATER COOLER

*Trade Mark

ACME PRODUCTS

Acme INDUSTRIES, INC., JACKSON, MICHIGAN, U.S.A.

CONTINUOUSLY SERVING THE REFRIGERATION INDUSTRY SINCE 1919

Washington News

LORING F. OVERMAN

AFTER all of the fuss and commotion over renewal of control phases of the Defense Production Act, possibly the June happening of greatest interest to H&V readers was the issuance of CMP Regulation 6, covering construction. The regulation, necessitated by the fact that the Controlled Materials Plan took over on July 1 the future distribution of steel, copper, and aluminum, defines how the construction industry is to operate under CMP.

CMP Regulation 6, unlike those covering manufacturing operation, is largely permissive in character, NPA explains. Owners and builders may elect to use CMP Regulation 6 to obtain construction materials, but they are not required to do so.

By the terms of Regulation 6, a prime contractor who wishes to undertake construction must (when required to do so by NPA Order M-4 or any other NPA regulation) submit an application on Form CMP-4C, to the appropriate government claimant agency or NPA industry division, requesting authorization to begin work. His application for authority to start work may be combined on the same form with an application for an allotment of the controlled materials he will need.

When such construction is authorized, the prime contractor will authorize construction schedules for his subcontractors and make necessary allotments to them from his own allotment.

Claimant Agencies Named

To assist NPA in handling construction applications, eight government agencies have been delegated authority to process requests for permission to build, and for allotments of materials. The agencies which are to handle applications are the Federal Security Agency, Veterans Administration, Housing and Home Finance Agency, Department of Agriculture, Department of Interior, Petroleum Administration for Defense, Secretary of Commerce, and Administrator of the Defense Transportation Administration. The Defense Department and the Atomic Energy Commission had previously assigned authority to approve construction.

Schools Act First

Of interest to H&V readers is the fact that the first of the newly designated agencies to use its new powers was the Federal Security Administration. In conjunction with the Defense Production Administration, FSA announced the allocation of steel, copper, and aluminum needed for essential school, college, library, hospital, and health facilities during the third quarter of 1951.

The amounts of steel, copper, and aluminum approved for delivery in the third quarter beginning July 1 are as follows:

	Hospital and Health Facility Construction	School, College, and Library Construction
Carbon Steel	75,000 tons	100,000 tons
Alloy Steel	0 tons	325 tons
Stainless Steel	950,000 pounds	80,000 pounds
Copper and Copper Base Alloy	4,600,000 pounds	600,000 pounds
Aluminum	550,000 pounds	0 pounds

The notification of the allotment of materials will be accompanied by an authorization from the Office of Education and the Public Health Service, FSA, for the institutions concerned to use a preference rating in purchasing equipment and supplies, such as boilers, elevators, sterilizers, classroom furniture and other necessary hospital and school equipment. Materials on hand on July 1 can be used without counting against the new allocations.

The announcement said that the allocation of materials was made because of the recognized importance of maintaining school and hospital construction at the highest possible levels. Allocations of critical materials have previously been made on a month-to-month basis. Under the CMP, claimant agencies will be receiving more specific requests for specific projects, which will make possible more precise estimates of materials required.

Educational Expansion Planned

Evidence that the educational program will continue to receive high priority, despite defense activities, is seen in the action of Rep. Barden (D-NC), chairman of the House Education and Labor Committee, in introducing a bill (HR-4468) to authorize a $300 million annual federal aid program for public school systems in the various states.

The bill provides for federal payments to the states on an annual basis to help them defray the cost of running their public school systems. Its benefits are confined to "public elementary and secondary schools" and the money could be used only for (1) teachers' salaries, (2) the pay of supervisory, administrative and maintenance personnel, (3) purchase of school laboratory equipment, and (4) building maintenance.

The measure thus would rule out federal spending for auxiliary services, such as school bus transportation and health programs. It would also bar the use of federal funds for textbooks and athletic stadiums.

The measure was referred to Mr. Barden's Committee on Education and Labor. A similar effort to authorize a federal aid to schools program in the last Congress bogged down in a dispute over whether parochial and private schools should be permitted to participate in the benefits of the program.

Over-All CMP Likely

First official hint of what to expect in the field of CMP was given at a mid-June press conference when

IN THE NATION'S LARGEST RADIANT HEATED HOSPITAL

—BYERS WROUGHT IRON PIPE SAFEGUARDS THE HEATING AND 6 OTHER SERVICES

In addition to its architectural distinction, this hospital is notable for its radiant heating system—an estimated total of 600,000 feet of genuine wrought iron pipe will be used for this service making it the largest radiant heating system ever installed in a hospital. In the Medical Unit shown above, over 130,000 feet already has been installed. The system, utilizing Byers Wrought Iron pipe, is designed to produce approximately two-thirds of the necessary heat. A ventilating system, taking heat from steam coils, makes up the balance. The radiant heating system is controlled by means of outdoor thermostatic equipment regulating the water temperature, and indoor zone thermostatic equipment operating zone pumps. Byers Wrought Iron pipe was also used in all hot and cold water lines, 3-inch and smaller; soil lines; waste and vent lines above ground; and hot water and hot recirculating lines in the tunnel piping. E. R. Little Company, Inc., are Engineers on the project.

The specifiers followed sound, proven practice by specifying genuine wrought iron. This material is serving in the oldest installations in the country, and its durability is further confirmed by previous records of long life under identical service conditions.

Our booklet, THE ABC's OF WROUGHT IRON tells the what, how, and where of genuine wrought iron. Ask for a copy.

A. M. Byers Company, Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, San Francisco. Export Division: New York, N. Y.

Why Genuine Wrought Iron Lasts

This notch-fracture test specimen illustrates the unusual fibrous structure of genuine wrought iron—which is responsible for the unusual corrosion resistance of the material. Tiny threads of glass-like silicate slag, distributed through the body of high-purity iron, halt and disperse corrosive attack, and discourage pitting and penetration. They also anchor the initial protective scale, which shields the underlying metal.

BYERS

CORROSION COSTS YOU MORE THAN WROUGHT IRON

WROUGHT IRON

TUBULAR AND HOT ROLLED PRODUCTS

ELECTRIC FURNACE QUALITY ALLOY AND STAINLESS STEEL PRODUCTS

NPA Administrator Manley Fleischmann announced that his agency has decided to ask makers of consumer durable goods for all the data which would be essential to bringing them under the plan in the fourth quarter of this year.

He said CMP forms will go out to these manufacturers about July 1 and be due back by the end of that month. These forms ask manufacturers how much production they want to attain in the fourth quarter and how much steel, aluminum and copper they would need to meet that goal.

Mr. Fleischmann insisted the final decision on whether to include these manufacturers in CMP has not yet been made.

Nice thing about the over-all CMP plan, on paper at least, is that an allotment of enough metals to make "x" quantity of gadjets, would carry with it authority to extend ratings for all other materials necessary to complete the job. Thus paper components, rubber, and even containers necessary to ship the products, could be ordered on a rating.

In some instances, it is hinted that the quantity of controlled materials allocated might be trimmed to meet the available supply of the other scarce materials required.

Thinking Changed

The most important thing about the announcement of a possible close-end CMP is the fact that official thinking has done a face-about. Instead of being just a little program with a few priorities, it now appears that the defense effort will pipe the tune, with the civilian economy dancing to whatever music it can hear after the defense bandwagon rolls by.

Boiler Production Up

The Census Bureau reports that there were 19,796 new orders for steel boilers in 1950 with a heating surface of 23,030,614 sq ft compared with 14,346 units of 13,094,902 sq ft in 1949. (Series: M25A-00). This represented a 38% gain in number of units and a 76% increase in terms of heating surface.

The 1950 total included 7,827 stationary power boilers with 16,468,567 sq ft of heating surface, an increase from 5,190 units of 8,097,503 sq ft in 1949; and 11,799 heating boilers with 6,162,049 sq ft, a gain from 9,080 units in 1949 with 4,715,400 sq ft. The Census Bureau pointed out that steel heating boilers with under 100 sq ft of heating surface, which numerically constitute the major portion of the steel heating boilers made, are not included in the present figures.

Fans, Blowers, Unit Heaters

Value of shipments of fans, blowers, and related equipment increased during the first quarter of 1951 over the fourth quarter of 1950, while unit heater shipments decreased slightly, according to the Census Bureau. The fans and blower group shipments were valued $29,721,000, an increase over $25,776,000 in the preceding quarter, while value of orders booked in the first quarter of 1951 amounted to $37,020,000 compared with $32,524,000 in the fourth quarter of 1950, a 14% increase.

Shipments of unit heaters and related equipment in the first quarter of 1951 were valued at $15,642,000, a slight decrease from $16,467,000 in the preceding quarter.

Fuel Publication Available

The Interior Department announces that the Bureau of Mines publication *Methods of Analyzing Coal and Coke*, first published in 1912, has just been released in its sixth edition. It is a standard reference work in laboratories and research centers where coal and coke are analyzed and heating values determined.

The revised edition was prepared by Dr. A. C. Fieldner, Chief Fuels Technologist of the Bureau of Mines, Washington, D. C.; and W. A. Selvig, supervising chemist of the Coal Constitution and Miscellaneous Analysis Section at the Bureau's Pittsburgh, Pa., experiment station.

The new 51-page bulletin, with charts, diagrams, and other illustrations, is designated as Bulletin 492, and can be purchased for 50 cents from the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Something Air Conditioning Can't Do

The halls of Congress and the offices of Senators and Congressmen boast some of the most effective air conditioning in the Nation's capital, but members of Congress still complain that mechanical cooling is no substitute for a summer vacation. As June flared up and simmered into what promises to be a scorching July, there was a feud on between members of the so-called Tuesday-to-Thursday Club, and the rest of Congress. Members of the "club" are those Senators and Congressmen whose home districts are close enough to Washington—mostly on or near the Eastern Seaboard—that they can leave on long week-ends—say from Thursday night to Tuesday morning.

Thus, with a total House membership of 435, recent Monday rollcalls have shown such attendance totals as 237, 277, and 287. And a recent Friday rollcall found 238 Representatives on hand.

Normally, because there are so many of them, Club members can obtain a gentlemen's agreement from the leadership that no important rollcall votes will be taken on Mondays or Fridays, particularly the former. But many nonmembers of the Club, who resent the geographical advantage enjoyed by the Club members anyway, are about fed up. They are organizing to make certain that Club members, with long week-ends, do not cheat less fortunate Congressmen and Senators out of vacations in distant states. Their strategy is to get Club members back on Mondays and keep them in Washington on Fridays by forcing important roll calls on those days.

How well that will work out remains to be seen, but it is now apparent that the half of the House and Senate members who normally stay in Washington and simmer during the summer are going to turn the heat on the others.

BRIEFLY STATED

• Technical papers on Radiant Heating, by F. W. Hutchinson, professor of mechanical engineering, University of California, and The Steady Periodic State —a Review of Some Computational Methods, by C. O. Mackey, professor of heat power engineering, Cornell University, are to be presented at the Building Research Congress, London, England, in September.

• A quick and pure water supply for small bodies of isolated troops is assured with an Emergency Water Treatment Unit developed at the California Institute of Technology. In a recent demonstration at the Air Force School of Aviation Medicine, the unit converted raw sewage with a bacteria count of 2½ million per cc into chemically pure and sterile water. Less than a cubic foot in size and weighing less than 12 pounds, the unit is operated by a simple hand pump; a strainer on an intake hose takes out algae, a chemical filter takes out suspended matter and kills bacteria. The unit will deliver pure water at the rate of two quarts per minute for 30 to 40 minutes, after which the filter must be replaced.

• 45,000,000 gallons of fresh water daily will be assured civilian and military users in Honolulu and Pearl Harbor with the completion of the Wajawa Gulch water tunnel in Oahu, Navy's $3,000,000 addition to Hawaii's water supply. Largest in the Pacific Islands, the Wajawa Gulch tunnel is 1,696 feet long, was commenced two years ago. Since volcanic nature of Oahu prevents digging wells straight down, engineers merely lay the wells on their sides, catch water by seepage from extensive rainfall. Similar tunnels, Red Hill and Wahiawa, have been furnishing most of Pearl Harbor water supply for years.

• Last month, during a three-day session in the Palmer House in Chicago, the School of Modern Heating notched its first year of existence. The heating school travels around the country under the auspices of The Institute of Boiler and Radiator Manufacturers and in the custom-equipped sedan driven by the instructor, Arthur L. Wales. Including the Chicago session, he had taken the I-B-R school to 44 cities and to more than 2,500 students.

• All-weather testing facilities nearing completion at the New York Naval Shipyard will include 14 test chambers and a refrigeration system, will produce wide range of humidity, temperature and pressure conditions for testing electronic equipment. Chamber design permits simultaneous exposures of components within range of 20 to 90% humidity while changing dry bulb temperature from 41F to 185F. Lowest temperature is —94F. Air pressure can be reduced to 80,000 feet above sea level. A vibration machine is capable of frequency range from 600 to 6,000 cycles per minute.

• Contracts for heavy construction amount to $296 million the week of June 7, an increase of 30.4% over the same week a year ago as reported by the Engineering News-Record. This volume is also 3.8% above the average week to date this year and 40% greater than the comparable average week to date in 1950. Private construction accounts for $148.3 million. Of this, industrial building contributes most with $87 million. Public works make up $147.7 million. This brings the 23-weeks of 1951 total to $6,551.8 million —up 35% over last year.

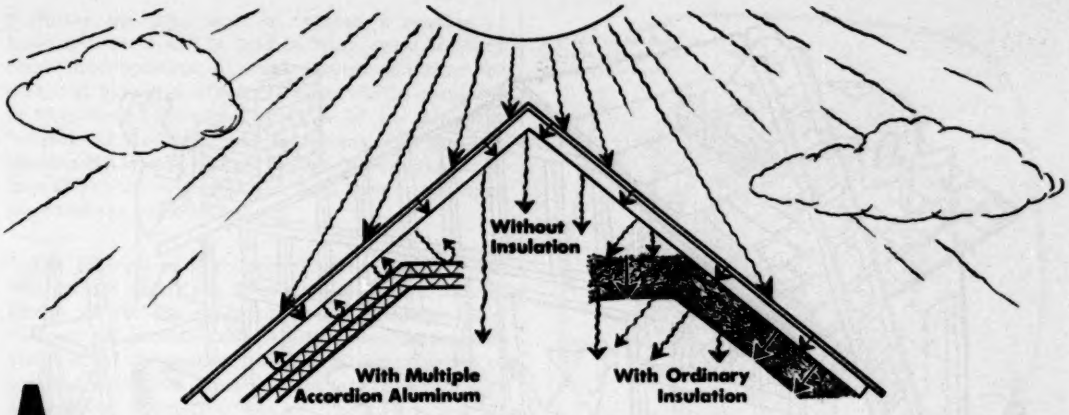
• The honorary degree of mechanical engineer was conferred by Stevens Institute of Technology on Theodore R. Peyrek, head of the Heating and Ventilating Division, L. J. Wing Manufacturing Co., Linden, N. J., at commencement exercises June 9.

• In recognition of "outstanding services to industry and the engineering profession," Alfred Iddles, president of The Babcock & Wilcox Co., was given the honorary degree of Doctor of Engineering by Polytechnic Institute of Brooklyn at the 96th annual commencement. A similar degree was given to John E. McKeen, president of Charles Pfizer and Company.

• An outstanding weather expert has forecast much colder weather in the next 15 years. In his paper, "Extrapolation of Sunspot-Climate Relationships," appearing in the American Meteorological Society's Journal of Meteorology, Massachusetts Institute of Technology Professor of Meteorology Hurd C. Willett reviews a study of 200 years of sunspot cycles and weather. Using a weather yardstick based on what has happened in the past two centuries, he concludes, "The temperature level over much of the world (including northeastern United States and southeastern Canada) will fall significantly during the next 15 years, probably reaching a first minimum level during the 1960-1965 pentad." He further finds, "This temperature fall will be sharpest where the abnormal warmth of the past 25 years has been most extreme . . . Another warm quarter century like the last one cannot be expected before the beginning of the next century, probably not before late in that century. Professor Willett concedes his weather yardstick may not be quite accurate, observing, "It is dubious procedure to base forecasts on incomplete data, but it is inconvenient to wait 200 years longer for the necessary data."

• York Corp., manufacturers of air conditioning and refrigerating systems, has announced the election to the board of directors of John R. Hertzler, vice president and general sales manager; J. Keith Louden, vice president and assistant to the president; and E. P. Vanderwicken, vice president and treasurer.

• The former heating and ventilating products and sheets and roofing products sales divisions of Inland Steel Products Co. have been consolidated into the new sheet metal products sales division, with E. J. Cullen as manager. The former metal trim products and metal lath products sales divisions were united under the name of the latter, with D. L. Rossiter as manager.



An Empty Roof Space Would Be The Best Insulation Against Summer Sun, *Were It Not For Radiation*

Convection is not a problem — there is no Convection downward. The only heat flow in summer through an empty roof space is Radiation, except for insignificant Conduction. Heat flow by conduction through roof spaces — through any building air space — is about 5%.

Ordinary insulation may retard heat for two or three hours, but builds up a large heat storage as compared to empty space. Fairly solid, it is a much better conductor of heat than empty air. Its surfaces absorb more than 90% heat rays. The heat passes through it by conduction, and is then radiated into the rooms at a 90% rate all through the day and into the night.

The solution is to use a material which has little substance and whose surfaces will not absorb nor emit appreciable radiation. Silver foil would be excellent but tough multiple accordion aluminum, which weighs but 1/5 oz. a sq. ft., is inexpensive and has practically the same heat-ray absorption and emissivity (2% more). It absorbs only 3% of the preponderant radiant heat flow through building air spaces inside walls, ceilings and roofs, and emits but 3%. It is non-condensation forming, impervious to vapor, and its multiple air spaces practically eliminate conduction. The commercial form is Infra Type 4 and 6.

The National Bureau of Standards Booklet BMS52, "Effect of Ceiling Insulation upon Summer Comfort," lists on page 10, the "insulations tested" in the order of decreasing effectiveness in protecting the ceiling against summer heat, as follows:

"1) Two layers aluminum foil (both sides of each layer reflecting).

"2) Full thick (3⅝") rockwool."

Try this test: Tack or scotch-tape 3 sq. ft. of multiple accordion aluminum (we will send it free on request) to the underside of a hot roof or ceiling, whether uninsulated, or insulated with ordinary insulation. Step in and out of the protected area beneath. The difference will be so marked, you will need no thermometer.

THERMAL FACTORS, TYPE 6 INFRA

Up-Heat C.089, R11.23 equals 4⅜" DRY Rockwool
Wall-Heat C.073, R13.69 equals 5⅓" DRY Rockwool
Down Heat C.044, R22.72 equals 9" DRY Rockwool

VAPOR PERMEABILITY equals ZERO

INFRA INSULATION, INC.

10 Murray Street New York, N. Y.

Telephone: COrtlandt 7-3833

INFRA INSULATION, INC.
10 Murray Street, N. Y. C. (Dept. V-7)
Please send FREE:

- ☐ Bureau of Standards Booklet, BMS 52, "Effect of Ceiling Insulation upon Summer Comfort."
- ☐ 3 Ft. Square of Multiple Accordion Aluminum for Test
- ☐ Infra Price List

Name_____

Firm_____

Address_____

. . . and for help with the temperature control, we'll talk to Honeywell!

The architect in Virgil Partch's cartoon has a mighty sound suggestion, because Honeywell *can* help heating engineers and contractors provide the proper thermal environment for any client—anywhere—in any kind of structure.

We have a lot of literature on the automatic control of all phases of heating, ventilating and air conditioning. Information you should have in your files.

And we have a lot of very well informed control engineers—in our 91 different offices—who have a lot more information right at their finger tips.

We sincerely believe we can help you on any project that poses problems of control of any kind—for *control* is Honeywell's business.

So, why not *talk to Honeywell?* Why not *write* to Honeywell for complete information on the equipment discussed in the column across the page? And why not do it *now?*

MINNEAPOLIS **Honeywell**

First in Controls

• During the third week in October, a meeting of building experts will be held in Washington to study recent developments in atomic energy affecting the design of buildings. The conference will be sponsored by the Nuclear Science Committee of the American Institute of Architects and the Atomic Energy Commission. BRAB will conduct this conference, and, later, in collaboration with the AIA, will issue a published report of the proceedings.

• The Division of Advanced Building Research has been formed within the framework of the Institute of Design of the Illinois Institute of Technology. The Division will be concerned with the scientific research analysis and development and the industrialization of building structures. This Division will cooperate with other units of the Institute of Technology and the Armour Research Foundation.

• Homer Addams, chairman of the board of directors of the Fitzgibbons Boiler Co., Inc., received the honorary degree of Doctor of Science at the commencement exercises of Albright College, Reading, Pa., on Sunday, June 3rd.

• W. L. Steffens, sales manager, insulation division, Philip Carey Mfg. Co., will retire January 1, 1952. He first joined the organization in 1911. J. C. Rector, present Cincinnati district manager, will succeed Mr. Steffens. Succeeding Mr. Rector, as Cincinnati district manager, is W. H. Skinner, formerly assistant district manager, who has been with Carey for the past 33 years. J. O. McFalls has been nominated to fill the vacancy created by Mr. Skinner's appointment.

• Election of E. W. Smith as a vice president of Owens-Corning Fiberglas Corp., has been announced. Mr. Smith is in charge of merchandising and advertising programs, branch office contacts, and sales recruiting and training activities in the company's general sales department, headed by Ben S. Wright, Fiberglas vice president and general sales manager. Prior to joining Owens-Corning in 1949, Mr. Smith was vice president for sales of Philip Carey Manufacturing Co.

• W. A. Siegfried, president, Superior Valve & Fittings Co., Pittsburgh, Pa., was elected president of the Refrigeration Equipment Manufacturers Association at its annual board of directors meeting held at The Homestead, Hot Springs, Va., on April 29. R. L. Sears, director of sales, Lynch Corp., Toledo, O., was elected vice president. Also elected were John E. Dube, president, Alco Valve Co., St. Louis, Mo., treasurer; and L. C. McKesson, vice president in charge of sales, Ansul Chemical Co., Marinette, Wis., secretary.

• Motorists using Pittsburgh's new Squirrel Hill tunnel on the Penn-Lincoln Parkway will be protected against carbon monoxide fumes by MSA Carbon Monoxide Recorders, which can detect one part of the deadly gas in a million parts of air. They are a development of the Mine Safety Appliances Co., Pittsburgh.

8¾" by 9" reproductions of this Partch cartoon are available upon request

For help with any control problem, talk to Honeywell!

Radiator valves, for instance . . .

Here's a remarkable advance in pneumatic valve design—Honeywell's new "Midget." Only *one-fourth* the size of the conventional valve, it's ideal for any application where you're pressed for space.

You'll find it mighty helpful when you're working on apartments, schools, hospitals and other large buildings that call for compact pneumatic heat controls. And your clients will like its neater, streamlined appearance; its lower installation and maintenance costs.

The Midget Radiator Valve is superior in *performance*, too. Special internal features such as interchangeable parts enable it to give true modulation of heat delivery for any size radiator or convector.

Development of this amazing new valve is just one more example of how Honeywell leads the way in improved design in the pneumatic heating control field. When it's used with the Room Grad-U-Stat—or any of the other dependable, accurate Honeywell pneumatic thermostats that are available—you have the finest kind of pneumatic heating control system yet designed.

☐ Please send me complete information on the V0501 "Midget" Radiator Valve and other pneumatic temperature controls.
☐ Please send me a reproduction of the Partch cartoon.

*Name*_____

*Firm Name*_____

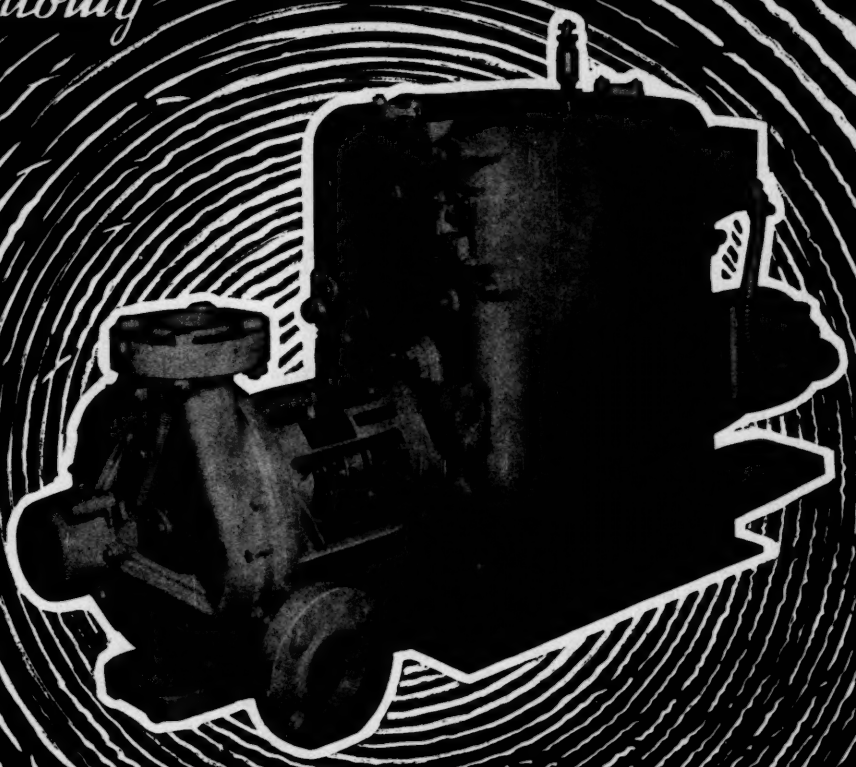
*Address*_____

Send this coupon today to Dept. HV-7-102 Minneapolis 8, Minn.

MINNEAPOLIS **Honeywell**

First in Controls

Centralized Heating Economy



A RETURN LINE VACUUM PUMP THAT CUTS HEATING COST.

This unusual pump needs no electric current, cutting out greatest item of pump operating expense.

More important, this pump insures absolutely uniform circulation in system. That means continuous steam economy.

Simple, compact, one moving element, no wearing parts, no internal lubrication. Bulletin No. 203 gives the facts. Your copy is waiting.

THE NASH ENGINEERING COMPANY
SOUTH NORWALK, CONNECTICUT, U. S. A.

The Effect of Ethylene Glycol on Pipe Friction and Heat Transfer

F. H. BRIDGERS* and JAMES BRICKER*
Los Alamos, New Mexico

With the advent of panel heating and snow melting installations, there has been an increasing use of antifreeze solutions in heating systems. The most frequently used antifreeze is the "glycol" type which is commonly used in automotive cooling systems. This article shows the properties of ethylene glycol solutions with particular attention to their action in piping systems.

THERE are several questions that arise in connection with the use of ethylene glycol. Two of the most frequent questions are the effect of ethylene glycol solutions on pipe friction and heat transfer. Other questions, such as the pipe corrosion effect, flammability, safety precautions necessary in regard to drinking water supply, and types of fittings recommended to prevent leakage have been discussed by R. P. Gorden (1)[1]. This paper will deal only with the effect on heat transfer and pipe friction.

Figures 1 through 6 show physical properties of aqueous ethylene glycol solutions at a wide temperature range. All data have been plotted from tables in a paper prepared by C. S. Cragoe (2). All data are based on pure ethylene glycol and water. The concentration of the aqueous ethylene glycol solutions is noted as per cent by weight ethylene glycol. It is sometimes more convenient to specify per cent by volume. The relationship between per cent by weight and per cent by volume after mixing for a given temperature is

$$\text{per cent by volume} = \frac{\text{per cent by weight} \times \text{specific gravity of solution}}{\text{specific gravity of 100\% ethylene glycol}}$$

Most commercial ethylene glycol antifreezes have inhibitors added to prevent corrosion which have an effect on the physical properties as presented in Fig. 1 through 6. The effect of one inhibitor, triethanolamine phosphate, as reported by Cragoe (2) is as follows:

Physical Property	Estimated Effect of Each 1% by weight of Triethanolamine Phosphate
Density	Increased, 0.2%
Freezing Point	Lowered, 1F
Boiling Point at 1 atm.	Elevated, 0.1F
Viscosity	Increased, 3%
Thermal Conductivity	Negligible

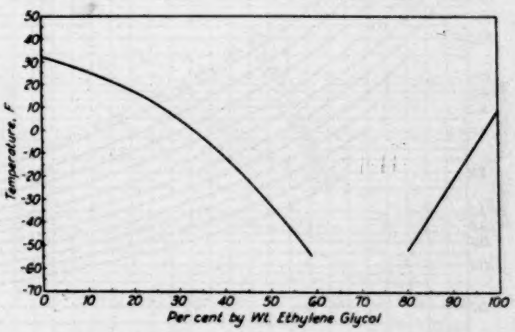


Fig. 1. Freezing protection of aqueous ethylene glycol solutions.

*Engineers for Charles S. Leopold, Consulting Engineer, Phila., Pa.
[1]Numbers in parentheses refer to references listed at the end of this article.

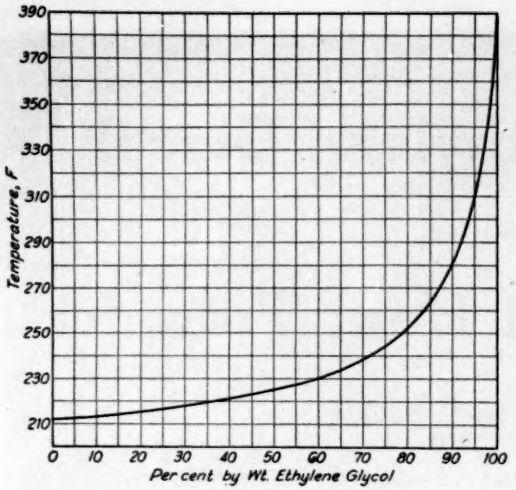


Fig. 2. Boiling point curve of aqueous ethylene glycol solutions at one atm.

Fig. 1 shows freezing-protection given by ethylene glycol solutions. Cragoe (2) does not report freezing points for solutions between 58 and 80%, but notes "the freezing points are probably below —50F but the results of different observers do not agree and the nature of the solid phase is doubtful." The National Carbon Company (Prestone) reports that a 60% by volume solution gives maximum freezing protection.

The effect of ethylene glycol on pipe friction is shown in Fig. 7. Only concentrations up to 60% are considered, since a solution of approximately 60% gives maximum freezing protection and, of course, freezing protection is the main reason ethylene glycol is used in heating systems. The ordinate, ratio of pressure loss of ethylene glycol mixtures to pressure loss of 60F water, was picked since most friction tables and charts for water, such as Cameron (3), are based on a temperature of 60F. Results shown in Fig. 7 could not possibly be exact for all possible pipe sizes and flow rates,

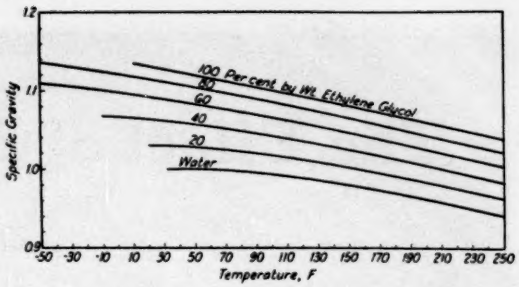


Fig. 4. Specific gravity of aqueous ethylene glycol solutions versus temperature (based on water of maximum density at 39.2F).

but for the pipe sizes and flow rates normally used in snow melting and panel heating piping systems the results are very likely within the accuracy of most methods used to compute pipe friction. The well known

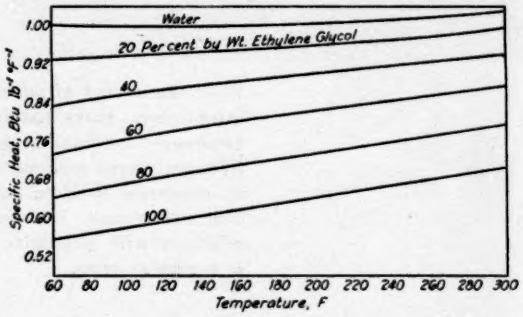


Fig. 5. Specific heat of aqueous ethylene glycol solutions versus temperature.

Fanning equation was used to calculate the friction ratio. The Fanning equation may be written thus:

$$h = \frac{f L v^2}{2 g D} \qquad [1]$$

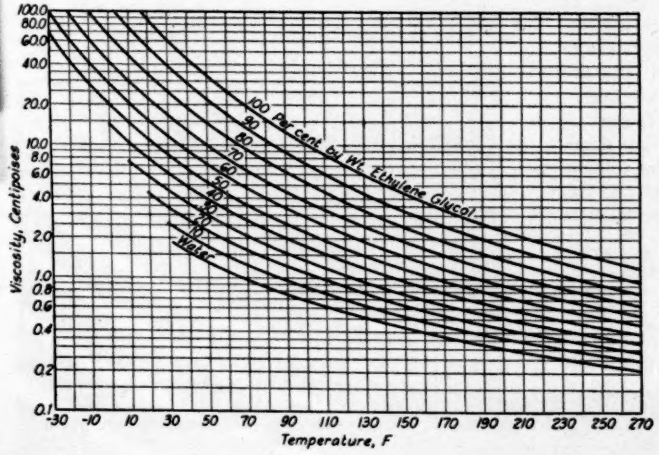


Fig. 3. Viscosity of aqueous ethylene glycol solutions versus temperature.

TABLE 1—EFFECT OF VARIOUS PIPE SIZES, FLOW RATES, AND TYPE OF PIPE ON RESULTS USING FIGURE 7
(For a 60% Ethylene Glycol Solution at 120F)

Size and Type of Pipe	Flow Rate, gpm	Friction Loss, feet of water per 100 feet		Per cent Difference Compared to Equation [1]
		Equation [1]	Fig. 7 and Cameron Table	
2" std. wt. commercial steel or wrought iron	30	2.39	3.52	+ 47%
	20	1.15	1.66	+ 44.3%
1" std. wt. commercial steel or wrought iron	6.0	3.44	4.86	+ 41.3%
	4.0	1.67	2.29	+ 37.1%
½" std. wt. commercial steel or wrought iron	1.5	3.44	4.76	+ 37.2%
	1.0	1.685	2.24	+ 32.9%
2" Type L copper	40	4.44	4.47	+ 0.67%
	30	2.63	2.62	— 0.45%
1" Type L copper	7.0	4.65	4.45	— 4.3%
	5.0	2.59	2.39	— 7.7%
½" Type L copper	1.5	6.27	5.62	— 10.3%
	1.0	3.05	2.63	— 13.7%

Where

h = head loss due to friction, feet of flowing fluid
f = friction factor, dimensionless
L = length of pipe line, feet
v = velocity of flow, feet per second
g = acceleration of gravity, 32.2 ft per sec²
D = inside pipe diameter, feet

The friction factor, *f*, in this equation is a function of the Reynolds number and was taken from a chart reproduced in Cameron (3) from Pigott (4). Fig. 7 is not exact for all pipe sizes and types, since it was

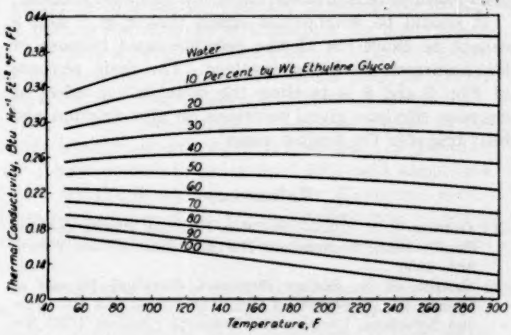


Fig. 6. Thermal conductivity of aqueous ethylene glycol solutions versus temperature.

calculated using Curve No. 8 in the Pigott (4) chart which is for 1 inch and 1¼ inch steel and wrought iron pipe.

The deviations obtained using Fig. 7 for various flow rates, pipe sizes and types of pipe is illustrated by Table 1. Table 1 shows for a 60% ethylene glycol solution at 120F, friction loss values obtained using equation [1], compared with values using the multiplying factor from Fig. 7 with the Cameron water tables. The large deviation between the commercial steel or wrought iron pipe and copper pipe is not surprising when a direct comparison is made between the Cameron water tables and values from equation [1] considering only 60F water. For example, if equation [1] is used for wrought iron pipe with 60F water, the friction loss value will be considerably lower (approximately 50% for flow rate ranges in Table 1) than values obtained from the Cameron water tables for wrought iron pipe (surface roughness factor, C = 100). On the other hand, for copper pipe, equation [1] gives slightly higher (approximately 5%) values of friction loss for 60F water than the Cameron water tables (C = 130).

It is important to note that Fig. 7 is for turbulent flow only. There is some discrepancy in the literature as to the value of Reynolds number that constitutes turbulent flow. Cameron (3) reports the transition range between 2,100 and 3,000, and for Reynolds numbers below 2,100, the equation recommended for the friction factor, *f*, is

$$f = \frac{64}{R_e} \qquad [2]$$

Where R_e = Reynolds number.

The Crane Company (5) recommends that values of R_e below 1,200 should determine the use of equation [2] to calculate the friction factor. The Crane Com-

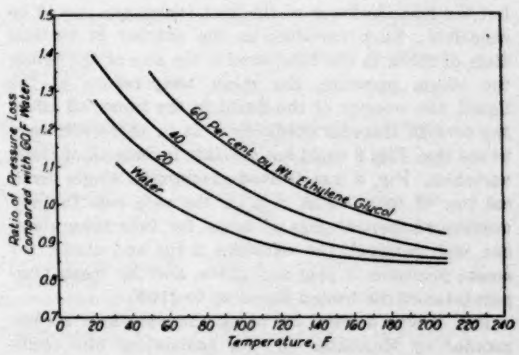


Fig. 7. Effect of aqueous ethylene glycol solutions on pipe friction.

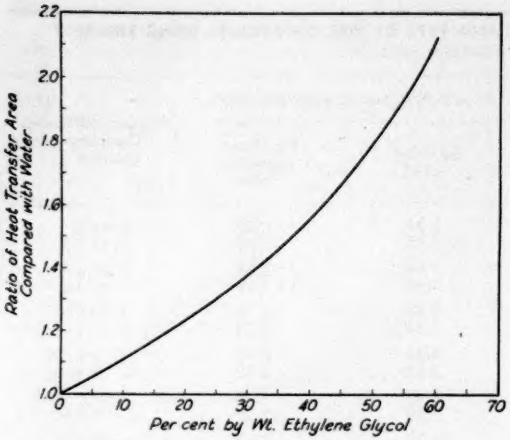


Fig. 8. Effect of aqueous ethylene glycol solutions on the size of steam water heaters of the horizontal shell and tube type.

pany recommendation is on the safe side, since, in the range of R_e from 1,200 to 2,100, f found from the Pigott (4) chart for tubulent flow is greater than f computed from equation [2].

Heat Transfer

The effect of ethylene glycol on the heat transfer from embedded pipes in plaster or concrete is negligible because the limiting factors to the over-all heat transfer are located outside of the pipe. However, aqueous ethylene glycol solutions will change the over-all transfer coefficient for heat exchangers considerably. It has been recommended by Gorden (1) that steam below 40 psig should be used as the heating medium, and whenever possible to avoid heating anti-freeze in coal- or gas-fired heaters or boilers.

Fig. 8 shows the effect of ethylene glycol solutions on shell and tube type steam heaters (liquid in horizontal tubes, steam outside). The ordinate is the ratio of area required for ethylene glycol solutions compared to the area required for water (at the same temperature). Fig. 8 should not be used to select a heat exchanger, since there are too many variables involved, but the manufacturer of the heat exchanger should be consulted. Such variables as the number of vertical tiers of tubes in the tube bundle, the size of the tubes, the steam pressure, the mean temperature of the liquid, the velocity of the liquid in the tubes, all affect the over-all transfer coefficient. It is, therefore, easy to see that Fig. 8 could not possibly include all of these variables. Fig. 8 was derived assuming a single vertical tier of tubes. Fig. 8 is on the safe side for any number of vertical tiers of tubes, for tube sizes above one inch nominal, for velocities 2 fps and above, for steam pressures 5 psig and above, and for mean temperatures of the heated liquid up to 210F.

Fig. 8 was derived by using the equations recommended by McAdams (6) for calculating film coefficients inside the tube for turbulent flow, and outside the tube for film type condensation.

The two film coefficients were used to calculate the over-all heat transfer coefficient, and thereby the ratio of heat transfer area required for various concentrations of ethylene glycol solutions as compared with heat transfer area for water.

An example will serve to clarify the use of Fig. 7 and 8. Assume a panel heating system has a 60% by weight ethylene glycol solution specified at a mean temperature of 120F with a flow rate of 15 gpm. To find the pipe friction, first,* use the normal method of calculating pipe friction for a water system as outlined in Cameron (3). Second, multiply the resulting pipe friction by the factor of 1.07 taken from Fig. 7 to get the pipe friction for the 60% ethylene glycol solution. It was somewhat surprising to the authors that ethylene glycol solutions have such a small effect on the pipe friction for heating systems. It is apparent from Fig. 7, though, that the effect of ethylene glycol would be considerable in cooling systems; that is, for mean temperatures below 70F.

The effect on the size of the heat exchanger is considerable as seen by Fig. 8. For the same amount of heat transfer, a steam heater for a 60% ethylene glycol solution requires over twice the heat transfer area as compared to a steam heater for water.

Another effect of ethylene glycol solutions that is worthwhile to point out is the change in the specific heat of the liquid mixture. For example, from Fig. 5 the specific heat of 60% ethylene glycol solution at 120F is 0.78 Btu per (F) (lb) as compared to .9995 for water at 120F. This would mean that a panel designed for a 20-degree temperature drop with water would require a 25.7-degree temperature drop with ethylene glycol assuming equivalent mass flow and heat transfer.

It should be emphasized again that Fig. 7 and 8 cannot be exact for all the possible cases because of the numerous variables involved. The main purpose of Fig. 7 and 8 is to show the quantitative effect of aqueous ethylene glycol solutions on pipe friction and heat transfer for limited cases.

References

(1) Gorden, R. P., *Official Bulletin*, Heating, Piping and Air Conditioning Contractors National Association, February, 1950.

(2) Cragoe, C. S., Senior Physicist, National Bureau of Standards, Properties of Ethylene Glycol and Its Aqueous Solutions, Cooperative Research Council, *CRC Report No. 9*, Society of Automotive Engineers, Inc., New York.

(3) *Cameron Hydraulic Data*, Ingersoll-Rand Company, Cameron Pump Division, Eleventh Edition (second printing), New York.

(4) Pigott, R. J., The Flow of Fluids in Closed Conduits, *Mechanical Engineering*, August, 1933, pp 497-501 and 517.

(5) Flow of Fluids Through Valves, Fittings and Pipes, *Technical Paper No. 409*, Crane Co., May, 1942.

(6) McAdams, W. H., *Heat Transmission*, Second Edition, McGraw-Hill Book Co., Inc., New York, 1942.

*A preliminary step for theoretical correctness, which may be omitted for practical purposes, would be to first convert the flow rate of ethylene glycol into an equivalent mass flow of water. This is done simply by multiplying the flow rate of the ethylene glycol solution by the specific gravity of the aqueous solution (from Fig. 4). For the example cited above, multiply 15.0 gpm x 1.058 (the specific gravity of 60% e.g. mixture at 120F taken from Fig. 4) to obtain 15.85 gpm. The 15.85 gpm instead of 15.0 gpm would then be used to calculate the pipe friction for water system.

How to Make a Survey

for air conditioning and refrigeration applications

JAMES PARTINGTON, Jr.
Direct Sales Division, Air Conditioning Department,
General Electric Co., Bloomfield, N. J.

Before a contractor can satisfactorily bid on an industrial installation, he must make a survey to learn, among other things, under what conditions the system will operate, or the process involved. This article presents practical instructions of value to the air conditioning and refrigeration application engineer.

THE quickest way to learn what we want to find out is to ask questions—intelligent questions—but enough questions. Almost always, help will follow when you ask for it. Even if the prospective customer does not have the answers to your queries, he will get the information for you, for he is usually better able than you are to tap the best sources of information. Not until you have all the answers to a problem can you fully comprehend its scope and effectively determine a course toward its solution.

Aside from asking questions, the first step in making a survey is to listen to what the prospect has to say, and then to evaluate the information. In many cases, he will have a fairly definite idea of what he desires performancewise, although his ideas may be purely theoretical or based on some empirical observations.

He may say, for example, "I have no trouble in the winter when I use city water for cooling. In the summer I have to reduce my output 50% and sometimes shut down the operation entirely." While this establishes the problem, it affords insufficient data on which to base an intelligent solution. What then do we need to know?

A breakdown of the energy input must be obtained to calculate the heat gain which the system must overcome. In addition to the conduction and sun effect components of the load, which are calculated in the normal manner, care must be exercised to determine accurately the number of people, lights, and motor horsepower, as well as the energy given off by retorts, solder pots, furnaces, bunsen burners and the like. Moisture release from gas appliances, quench tanks and plating operations must also be carefully enumerated, especially where close humidity control is required.

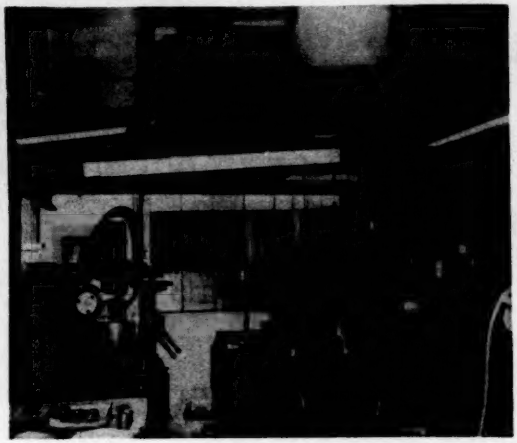
In addition to the more usual heat gain components, what further information must be gathered? The check list of Table 1 covers most of the items, why such information is necessary, and where such data may be obtained.

Knowing these answers, or at least to those which are pertinent to the particular problem, you are now equipped to attack the problem intelligently so as to submit a sound engineered proposal for its solution. In this connection, it is frequently advisable to prepare a reasonable number of alternate plans should the problem lend itself to such treatment. Budgets are not made of rubber and a compromise solution may have to be accepted.

During the survey, whenever any large items of energy input are encountered, immediate steps should be taken to learn whether such loads can be diminished. Factful inquiries may determine that motors could be located outside of the air conditioned space by running motor shafts through the wall. Hoods can frequently be installed to remove heat at its source before it can spread to the entire space. Ovens can sometimes be

TABLE 1—CHECK LIST CONCERNING IMPORTANT DATA.

Item	Why Necessary	Where Obtained
Brief story of process	Orient design	Mfg mgr or plant engr
How vital is job?	To find if spares are required	Mfg mgr or plant engr
Is production rate likely to increase?	Influences equipt choice	Mfg manager
Is load constant?	Influences equipt size	Production mgr
Range and rate of load variation	Influences system design	Production mgr
Operating range limits	Influences control selection	Quality engr
Energy input	Determines heat gain	Plant engr
Cost of electricity	Influences system design	Plant engr
Electrical characteristics	Influences Equipt selection	Plant engr
Is cooling water available?	Influences system design	Plant engr
Cost of water	Influences system design	Plant engr
Max summer water temp	Influences equipt selection	Plant engr
Min winter water temp	Influences equipt selection	Plant engr
Max safe water temp	Influences system design	Prod. mgr
Water quality	Influences equipt selection	Water dept
Ventilation air—quality and source	Influences equipt design	Plant engr
Electric power source and characteristics	Influences equipt selection	Plant engr and power co.
Architectural plans	Influences equipt location	Plant engr
Can work be done in normal working hours?	Influences price	Prod. mgr or plant engr



Typical tool and gage room application. All equipment is located on platform above room floor. Year-round day and night conditions are maintained at 72F and 50% R. H.

relocated so that only their doors are within the area to be conditioned. Vents can be installed to remove noxious fumes at the source and thus reduce excessive quantities of ventilation air. Frequently, furnaces can be enclosed separately. Since money spent on structural changes is often less than expenditures for added cooling capacity otherwise required, finding ingenious ways to reduce the total heat gain pays off in more installations and better satisfied customers.

If, as the application problem unfolds, you find more information is vital, do not resort to guesswork. At best, you have only a 50-50 chance of being right, and too much of both the prospect's money and yours are at stake should you guess wrong. Also, a good survey will reduce the need for return calls and will speed up the preparation of your proposal. Time is important. If too much time is taken in arriving at an answer, the prospect may tire of waiting and call in one of your competitors; or one who has been with the problem from the start, may beat you to the punch.

Determine Operating Range

When the prospect states he wants certain conditions maintained, find out the operating range limits—what tolerance he can accommodate. Must conditions be held right on the button or will a definite operating range be satisfactory? Learn whether or not the limits are one-sided. As an example, consider a lacquer spray room where the design conditions, as originally stated, were 80F dry bulb, 50% relative humidity in summer and 75F dry bulb, 25% relative humidity in winter. Accepted at face value, normal design practice would have produced an unsatisfactory solution to the problem. By further questioning, it was brought out that, with humidities above summer design, blushing would be produced (the clear lacquer would turn whitish) and at humidities below winter design conditions, the lacquer would dry too fast and produce hairline cracks. Normal design with its $\pm$ 5% variation in humidity would have proven disastrous. Actual summer indoor design, therefore, has to be based on 45% R.H. at 80F to be safe. In this case, safety could have meant elimination of several days' spoilage at $2,000 a day, plus the lost production time while the system was being corrected to avoid this production problem.

The 75F D.B. indoor winter design condition seemed too high. A few simple calculations, however, showed that the air velocity, which was high around the spray booths to effectively remove the lacquer fumes, made the operators feel chilly if the air was supplied at any lower temperature.

Check Design Conditions

It is not always possible to accept the prospect's stated design requirements at face value. Extreme diplomacy is required, especially if the prospect's product has to be tested in accordance with a set of specifications provided by the prospect's customer. It is doubly difficult if this customer is Uncle Sam, although, here again, the question routine proves invaluable and affords an opening for suggestions.

In one case, the purchasing agent specified the chilling of a rather large air volume at 30 lb per sq in. air to —30F dew point. Questioned about this, he could give no definite reason for needing such dry air except that the engineer in charge of the test project had so written the design conditions. It was then tactfully pointed out, that a somewhat parallel test job for a company engaged in similar manufacturing had been satisfactory when three grains of moisture were left in the air to be cooled to —30F. The final step of that cooling was accomplished by an expansion turbine which reduced the air temperature from 30F to —30F as the pressure in the air was released, and in so doing performed work. The moisture which could not be held in the air at —30F became snow. This had no serious effect on the process once the recording controlling instrument bulbs were shielded to prevent receiving erroneous impressions.

Since the purchasing agent was still unconvinced, and even remained so when advised it would be expensive to achieve such arid air, savings were illustrated by quoting an alternate to the base bid. The alternate proposed was —30F air with three grains of moisture instead of air at —30F dew point. The removal of those few extra grains (1,975) would have raised the price of the refrigeration machines alone from $15,000 for the alternate to $22,000 for the base bid. In addition, the floor space required would have been doubled, and the operating cost of the steam reactivation equipment trebled. In this example, questions alone were not sufficient to save extra engineering time and expense.

This example does bring out a good point to remember when working on industrial proposals. Some rough calculating of loads at the time the survey is being made can save much unnecessary work later on.

When the process involves fluids other than water, or gases other than air, find out by questioning the specific gravity, specific heat, conductivity and, in the case of liquids, the viscosity. It is not necessary to quibble over the units in which the answers are given

(conversion factors are obtainable) as long as the answers are labeled. If the prospect does not have these data, try to determine the source of supply of the fluid. If you can learn, for example, that Texas Company, No. 32 quenching oil is to be used, it should be relatively easy to obtain the thermodynamic properties of the liquid from the vender.

In such low temperature applications where pull-down time is important, if the objects to be cooled are composed of heterogeneous materials, it is vital to know the proportions by weight of each of the components. Should some of the components be proprietary secrets, at least obtain the specific heats of elements, X, Y and Z, and the quantity of each.

Most industrial process applications require that design conditions be maintained regardless of outdoor or ambient conditions. Thus the usual comfort conditioning criterion of taking care of only 85% of the worst possible conditions must be ignored. If it is found that serious loss will result from exceeding the product design conditions, the local extreme outdoor weather conditions should be ascertained. Extreme weather does not necessarily mean the hottest days, should humidity be the design criterion, but those periods in which the highest number of grains of moisture are present in the air. Such information was of particular interest in the lacquer room installation mentioned. "Local" was stressed, since local weather may differ appreciably from the conditions which exist in the nearest city where weather records are regularly kept. The plant engineers' records, in such cases, should prove more reliable than that of the Weather Bureau.

Some prospects, knowing you are in the industrial field, may ask questions about methods employed by their competitors. This can prove embarrassing, especially if you have done work for the competitive companies. Some processes and even industries are built around secret formulas as, for example, those used in the brewing and textile fields. The disclosure of any trade secrets, even unwittingly, would be a breach of good business ethics, and would result in your prospect being doubtful as to your ability to respect a confidence.

One air conditioning manufacturer, in his advertisement, cited the benefits of refrigeration in the manufacture of lipsticks. The manufacturer obtained the application story from the contractor who had installed the job. Several inquiries from cosmetic companies resulted from this striking advertisement. One particular inquiry showed that the interest engendered was not so much about the cooling operation, as it was

TABLE 2—TYPICAL INDUSTRIAL SURVEY FORM FOR AIR CONDITIONING OR REFRIGERATION.

Customer..... Buyer.....

Address..... Engineer.....

Survey By..... Date.....

Type of Application.....

Extreme Outdoor Temperatures: Summer..... F db ..... F wb
Winter ..... F db ..... F wb

Extreme Ambient Temperatures: Summer..... F db ..... F wb
Winter ..... F db ..... F wb

GAS (OR AIR) COOLING

Maker's Designation .....
Specific Heat..... @ Constant Volume..... @ Constant Pressure
Pressure..... Altitude.....
Quantity..... Cfm Cooled from..... F to..... F
Moisture Removal from..... Grains to..... Grains
Tolerance ±..... F, ±..... Grains or ±..... % R.H.
Ventilation Air Quantity..... Cfm. Impurities.....

LIQUID COOLING

Liquid..... Vendor's Designation.....
Quantity..... Gpm Pressure.....
Specific Heat..... Btu/Lb, F, Conductivity.....
Viscosity..... @ ..... F. ..... @ ..... F Density..... Cu Ft/Lb
Cooled from..... F to..... F. Tolerance ±..... F
Corrosive Properties .....
Preferred Materials .....

SOLID COOLING

Material..... Vendor's Designation.....
Specific Heat..... Btu/Lb, F, Conductivity.....
Density..... Cu Ft/Lb, Unit Volume..... Unit Surface..... Sq Ft
Quantity..... Lb/Hr Cooled from..... F to..... F
Method of Handling.....
Method of Cooling: Contract..... Gas Convection..... Radiation.....
Liquid Convection..... Immersion..... or Spray.....

THERMAL PROPERTIES

Boiling Point..... F, Freezing Point..... F
Latent Heat of Vaporization..... Latent Heat of Fusion.....

LOAD CHARACTERISTICS

Constant..... Variable..... Range..... to..... %
Expanding Production..... Key Process.....

CONTROLS

Pneumatic..... Electrical.....
Fully Automatic..... Semi-Auto. ..... Manual..... Sequence.....

UTILITIES OR SERVICES

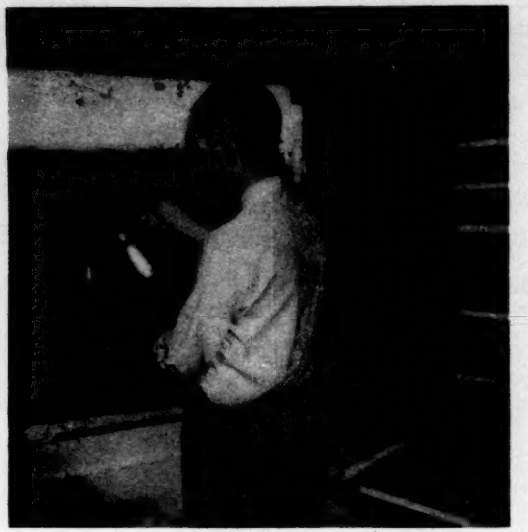
Extreme Water Temp. Winter..... F, Summer..... F Cost...../M Gals
Available Quantity..... Gpm Quality.....
Electrical Characteristics..... V..... Ph..... Cyc. Cost..... ¢ Kwh
Steam Pressure..... lb/sq in. gage Quantity.....
Availability ..... Hrs/Day Superheat ..... F
Drain Capacity..... Storm..... Sanitary .....
Compressed Air Available..... Pressure..... lb/sq in. gage

GENERAL

Plans Available..... Max. Floor Loading..... #/□'
Foundations Suitable..... Work Schedule.....
Work by Owner.....
Largest Door to Equipment..... X .....

COMMENTS

Date of Next Appointment: .....



Spray painting kitchen clock cases in a controlled atmosphere room.

in specific data covering how the other company made its lipsticks. The interest was not so much in the ingredients, for all lipsticks are basically 60% castor oil, but in how respective manufacturing operations were performed. To disseminate such information would be definitely unethical. To shut up like a clam would be impolite. What then, is the middle course in such a situation? In this instance, the prospect was advised to solicit advice from one of the many industrial processing consultants. Were he really serious or in enough trouble to pay for assistance, he was helped without violating a confidence.

Should a process application be unearthed that may require special heat exchangers, it would be extremely helpful to find out everything possible about the material to be cooled. A recent example involved condensation of methyl alcohol out of a gaseous mixture of carbon dioxide, carbon monoxide, methane and hydrogen. A corrosion problem was indicated. The contractor could have saved himself many hours time had he asked the prospect what materials had been found to be most successful in withstanding the effects of this mixture. Unless it was an entirely new process to the prospect, he would know from actual operating experience what materials performed best and would most likely be satisfactory in a heat exchanger. When the prospect commences talking chemical terms and you are no chemist, that is the cue to start asking questions.

Fumes and Dust

The presence of abrasives, inflammable or explosive vapors or dusts and corrosive fumes should be carefully noted, since their effect on the life of equipment or the safety of the people may be extremely harmful. The action of salt air on aluminum ducts and coil fins or the reaction of copper pipe to ammonia fumes point up the necessity for caution. Here again, the people who live with such hazards every day are in the best position to advise about suitable precautionary measures.

It will naturally be of interest to know whether competition is figuring the job, and the manner in which they intend to handle it. The latter point is most important should they turn out to be the successful bidder. Some jobs have been lost because the other fellow proved to be a more capable application engineer. He may have combined chemical drying with refrigeration, for instance, instead of trying to handle the problem entirely with refrigeration, and, by so doing, satisfied the customer's requirements. Such after-the-fact questions will usually be met with a cooperative attitude and definitely increase your store of knowledge as well as increasing your chances of success on the next similar proposition. It is not safe to discount the opposition even should you be certain you have designed the perfect system. Thrash out with the prospect, at the time of the survey, all the obvious methods of solving the problem. Your questions may make him disclose a preference for one or the other method. It is entirely possible that the seeds of this preference were planted by competition. Based on the prospect's answers to your other questions, it should be possible to determine whether this may be the case or not.

The quantity method in asking questions generally pays off. Much seemingly irrelevant information proves to be valuable as you proceed with the solution of the problem. Do not trust your memory to retain all the answers—take copious notes, and make sketches showing equipment space limitations, proximity to all important facilities, and connection sizes of all pipes and ducts to which you may have to connect.

Summary

After the many steps have been taken in making an industrial application survey, you should possess the following information:

(1) A clear understanding of the problem.
(2) Most of the necessary data required for its solution (obtained by asking questions).
(3) An evaluation of the answers which has formed a basis for the tentative solution.
(4) A general idea of the equipment required and a rough cost estimate.
(5) A determination of the prospect's qualifications as a source of business.
(6) A definite idea as to what further steps should be taken.

If any of this information is lacking or incomplete, further questions are indicated. In other words, imitate the insurance doctor who is giving you a physical when you want to take out a $100,000 life insurance policy. He will do a painstakingly exact examination job, including asking numerous questions, just as you will do when you are surveying an industrial application of air conditioning or refrigeration.

A typical industrial survey form is offered as a guide for your questioning, and a handy means on which to record the answers.

Cooling an Egg Grading Plant

Design Data and Special Handling Problems

A JOINT study, completed recently by Frigidaire Division of General Motors and Ohio State University, outlines a typical layout for an average sized egg purchasing and grading plant. General requirements call for a building approximately 40 by 90 ft, divided into three equal room sections, each 40 by 30 ft. One can be used as a refrigerated receiving and precooling room for removing the heat from eggs upon arrival at the plant and to hold them until they are ready for candling and grading. The latter operation is located in the second room, and the third room is designed for storing the eggs after they have been graded and packed for shipping.

The general construction of the building should include a peaked roof with a generous air space above the ceilings of the refrigerated rooms. This space should be well-ventilated so that during the summer months a natural draft will reduce temperature of the ceiling of the refrigerated rooms below. A flat roof of a refrigerated room exposed to direct sunlight can easily reach a surface temperature of 120F or more when the surrounding air temperature is only about 90F, creating an additional refrigeration load and resulting in high operational costs. In addition, walls exposed to the sun should be coated with white, buff or aluminum paints which reflect heat rays and help reduce the load even further. The minimum height of refrigerated storage rooms should be nine feet to allow for proper installation of overhead cooling units.

Three-Inch Insulation Advisable

In sections of the country where low temperatures are common during the winter months, it is advisable to use a minimum of three inches of insulation in the receiving and holding rooms, thus reducing the possibility of freezing eggs in storage. In addition, it is suggested that heating facilities be provided for these two rooms as a positive protection against extended periods of cold weather.

Moreover, refrigeration compressors should be placed in a room where heat is provided if there is danger of frozen water lines. Insulation used should be applied so that the infiltration of moisture can be held to a minimum. If cork-board is employed, it should be laid in asphalt. With other types, a suitable moisture-vapor barrier must be provided, depending upon the requirements of the insulation.

Before describing the various refrigerating systems which can be employed, it might be wise to consider a few of the more important aspects of egg preservation. Eggs are especially susceptible to loss of moisture. For this reason it is important that any refrigeration system applied to egg cooling be so designed that it will maintain a high moisture content in the atmosphere. If the surrounding air is dry, eggs may deteriorate through loss of moisture. Moreover, eggs must be quickly cooled after they are received. Otherwise, large air cells, thin whites, and dark yolk shadows develop, and microorganisms on the shells may result in spoilage within a relatively short time.

Selection of balanced refrigeration equipment, which will afford fast initial cooling, correct storage temperatures and the proper amount of moisture, is one of the most important phases of the job. The difference between room air temperature and the operating refrigerant in the systems for gravity-type cooling equipment should not exceed 18 degrees and if it is kept down to within 10 or 15 degrees, will do a better refrigeration job. The same holds true for forced air equipment; however, the temperature difference should be even less—not exceeding nine degrees. If the difference is held to within five or six degrees, so much the better.

Receiving and Cooling Room

In order to calculate the refrigeration required, it is necessary to assume certain operating conditions insofar as the flow of products through the plant is concerned. Therefore, consider a plant which operates from 8 a.m. to 6 p.m. in the receiving and precooling room and from 8 a.m. until 5 p.m. in its candling and grading room.

Eggs are received in crates containing 30 dozen. Dimensions of the crates are 12 by 24 by 14 inches and have a gross weight of 56 lb. Of this total weight, 45 lb are eggs and 11 lb are the crate and fillers. The specific heat of eggs is given as 0.76 and crates and fillers, 0.5. Eggs will be about 80F when received and will be reduced to 50F while in the receiving room.

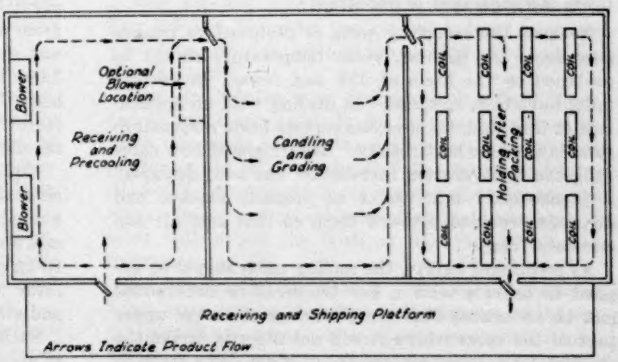


Fig. 1. Plan of egg grading plant.

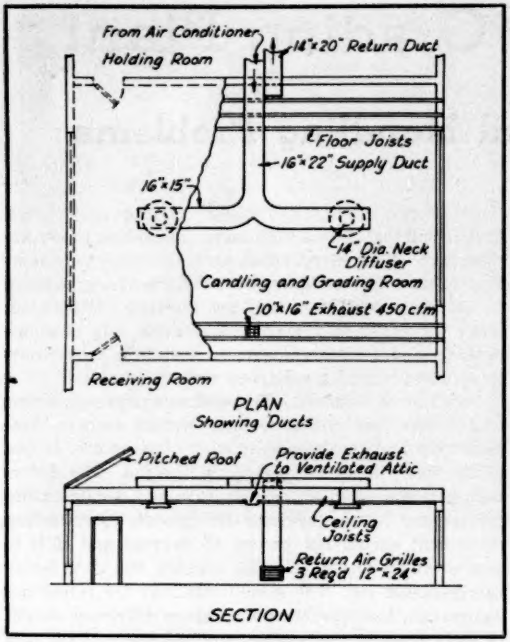


Fig. 2. Air distribution system.

About two and one-half square feet of floor area has been allowed per crate, which will include aisle space to facilitate handling and stacking them five high. On this basis, the receiving room has a storage capacity of 2,400 crates. In determining the refrigeration equipment required for a specific job, it has been assumed that not more than 1,200 crates of eggs will pass through the receiving room within a 24-hour period.

If eggs arrive at the plant at a fairly uniform rate during the working day, the minimum time for cooling would be from 6 p.m. to 8 a.m. on the following day, or a total of 14 hours. A maximum time of 22 hours for cooling would result between 6 p.m. to 4 p.m. on the following day. Therefore, the refrigeration equipment should be based on an average cooling rate of 18 hours for 1,200 crates per day.

Crate Arrangement is Important

Because the receiving room is designed to remove heat from the product, room temperature should be designed on the basis of 45F and forced air cooling units have been specified. In dealing with an application of this kind, the user has certain basic responsibilities to produce best results. Regardless of how carefully the refrigeration installation has been designed, it is necessary that crates be properly stacked and dunnage provided between them so that cool air can circulate freely.

As mentioned before, the cooling units should be applied to operate with a low temperature differential and be so located that air discharges into the upper part of the room where it will not directly strike the product. The chilled air will then diffuse down through the stacks of crates and return to the cooling unit for heat removal and recirculation. Ducts may be used to distribute the cool air but are not absolutely necessary in the type plant being described.

Considering an average summer ambient temperature of 90F and 80F condensing water, water-cooled compressors have been selected to operate the cooling units. If conditions vary, different equipment may be specified. For instance, where water is scarce or expensive, evaporative-type compressors or water towers may be required to keep the daily operating costs down. Based on an 18-hour operating schedule and considering heat leaks in the walls, ceiling and floor of the room, together with the product heat, the refrigeration equipment must be adequate to handle an hourly load of about 108,000 Btu.

Because egg crates, fillers and the eggs, themselves, are often contaminated with mold, installation of 30 Sterilamps may be included, using 22 of the low ozone and eight of the high ozone type—each 30 inches long. Sterilamps will assist with the reduction of airborne contamination.

Refrigeration equipment for the receiving room will consist of: (1) A 10-hp water-cooled compressor or evaporative-type compressor, depending upon the water supply; (2) two forced air cooling units equipped with three-horsepower fans and expansion valves; (3) accumulator interchangers and dehydrators; and (4) two refrigeration doors, and approximately 10,980 board feet of insulation.

Candling and Grading Room

The candling and grading room calls for air conditioning type cooling. Space between the room ceiling and the roof can be used for installation of supply and return air ducts. Windows will be included in both exposed, outside walls. However, if one faces the sun, venetian blinds should be employed to reduce heat from the rays. It is recommended that a suitable vapor barrier material be incorporated into the walls, floor and ceiling to minimize the infiltration of moisture into the room. Also, tight-fitting doors and windows are suggested to help reduce condensation on the eggs.

Air conditioning equipment specified has been based on outside design conditions of 95F dry bulb and 75F wet bulb readings. Inside, the temperature would be about 65F with 45% relative humidity. Lower than normal room temperatures are provided to keep eggs from warming up when they pass through the candling and grading room. With 15 workers employed here, 1,000 watts of lighting, three outside air changes per hour included for ventilation and other influencing factors, the cooling load will be 62,787 Btu per hr of sensible heat gain and 91,705 total heat gain.

Equipment would consist of: (1) Either a vertical or horizontal type central system air conditioner with a nominal cooling capacity of 12 tons, circulating 3,000 cfm and equipped with a 10-row Freon coil; and (2) a 10-hp water-cooled compressor, equipped with evaporator regulating valve, thermostatic expansion valve, and strainer.

Such an installation will provide sufficient capacity to air condition a small office in addition to the actual candling and grading room. Operating conditions will

make it necessary to reheat the air in order to maintain the desired 65F with a 43F dew point. The reheating requirement will be about 107,000 Btu per hr. Winter heating may also be included in the air conditioning unit either by installing additional heating coils or by selecting a larger steam coil to handle the heating load. Conditioned air will be distributed throughout the room through two discharge outlets in the ceiling, connected with the air conditioner by ducts.

Holding Room

After eggs have been candled, graded and crated, they are moved into the holding room for storage until shipment from the plant. Here again crates should be stacked five high with necessary dunnage provided for proper air circulation. To prevent eggs from "sweating" when placed on trucks for shipment, the temperature should be held at 55F with the moisture content of the air high enough to reduce dehydration. To obtain these important results, overhead gravity-type cooling units have been specified to supply refrigeration.

With approximately 1,200 crates of eggs per day moving into the room from the candling and grading room, the temperature of the eggs and containers must be reduced from 65 to 55F. Based on an 18-hour per day operation, the cooling system must be adequate to handle 49,500 Btu per hr. Overhead gravity cooling coils of the finned type are equipped with drip pans and baffles and have a low temperature differential of from 14 to 18F. Sterilamps are also recommended for use in the holding room.

Actual refrigeration equipment required consists of: (1) A seven and one-half horsepower water-cooled compressor or evaporative-type compressor, depending upon the water situation; (2) 12 gravity-type 126-inch cooling units, each equipped with an expansion valve; (3) an accumulator-interchanger; (4) a dehydrator, and (5) about 10,980 board feet of insulation and two refrigeration doors. In addition, 30 Sterilamps, of the same type used in the receiving and cooling room, are suggested to reduce airborne contamination.

The layout of the over-all plant does not take into consideration other necessary facilities such as offices, washrooms, locker rooms for employes or space for a heating plant and for refrigeration compressors. Facilities for miscellaneous storage such as packing materials, extra crates and other items should be provided. In addition, the building design shows a receiving and shipping platform extending the entire length of one side of the structure.

The flow of eggs starts in the receiving room and moves to the grading and candling room, thence to the holding room for storage until shipment. Roller or belt conveyors can be used extensively throughout the plant, facilitating the movement of heavy crates.

Predicting the Interchangeability of Fuel Gases

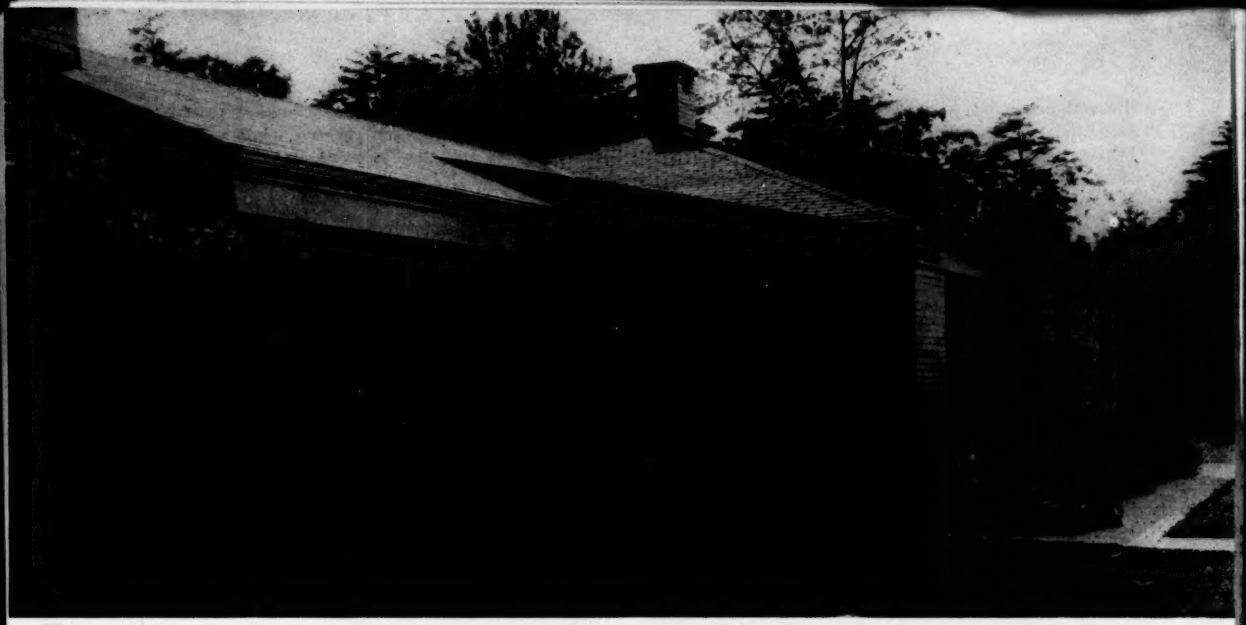
When gas-burning appliances have been adjusted for gas of one composition, flame characteristics will generally change if another kind of gas is substituted. While some substitutions will be entirely satisfactory, others will result in dangerous or unsatisfactory operation. Elmer R. Weaver of the National Bureau of Standards gas chemistry laboratory has recently formulated a new method for predicting the extent to which different gases will depart from exact interchangeability. Using six indexes, four of them new and all easily computed from the gas composition, the NBS-Weaver gas interchangeability prediction method appears to be more accurate than any method hitherto proposed.

Gases are said to be exactly interchangeable when no difference can be seen or measured in the characteristics of the flames produced. When undesirable changes do not occur to a greater extent than is thought permissible, the gases are still called interchangeable or practically interchangeable. No entirely satisfactory method has yet been found for predicting the extent of departure from exact interchangeability, although such a method is badly needed and although a large amount of both theoretical and experimental work has been done in an effort to meet this need.

A gas flame may be unsatisfactory in several distinct respects. The flame may (1) blow away or lift from the burner ports; (2) flash back into the burner; (3) liberate enough soot to discolor surrounding objects (a condition that is more quickly judged by observing the yellow color of the flame than by watching for the appearance of actual soot); or (4) liberate carbon monoxide as a result of incomplete combustion. The four new interchangeability indexes of the NBS-Weaver method relate to these four pheonomena: lifting, flashback, yellow tips, and incomplete combustion. The two old indexes incorporated in the new method concern rate of liberation of heat and supply of primary air. Two gases are interchangeable by the definition given if they are interchangeable with respect to the first four indexes. However, the last two indexes must also enter into a consideration of the total effect of a change of gas supply.

The new indexes were derived in part from theory and in part empirically. In the process, data from the many thousands of both the earlier and later tests reported by the AGA were carefully plotted and tabulated. The present study clearly demonstrates that no single formula for interchangeability compares in value with either the NBS or AGA set of separate indexes.

A contemplated gas change presents two questions. First, what will be the effect of the change on the several significant aspects of appliance operation: lifting, flashback, yellow tips, and incomplete combustion? Second, how much change is permissible?



Residence in which tile floor heating and cooling system is installed.

Heating and Cooling with Air in a Radiant Tile Floor

L. BERT NYE, Jr.
Washington Gas Light Co., Washington, D. C.

A hollow tile floor heated by air in winter and cooled by air in summer has been used successfully to provide year-around home comfort.

EXPERIENCE has shown that the heating of residences by warm floor panels can provide most comfortable living conditions with even temperature distribution. It is also true that only year-around air conditioning can bring the benefits of humidity control, air cleaning, and air temperature control summer and winter. The advantages of both of these methods have been combined in the unique system installed in the home of S. H. Vuncannon at Cheverly, Maryland.

This house was constructed with floors of Radiantile, a new product of National Fireproofing, Inc. Radiantile is cast in units 12 inches square and 4 inches thick. One square side is glazed to provide an attractive floor surface. Within the tile are three horizontal channels through which air can be circulated to heat or cool the floor.

In the system installed in the Vuncannon home, air from a Servel gas-fired all-year air conditioning unit is delivered to trunk tile which run beneath and transverse to the channels in the floor tile. Passing up into each channel of the floor tile through holes in the trunk tile, the conditioned air crosses under the entire floor

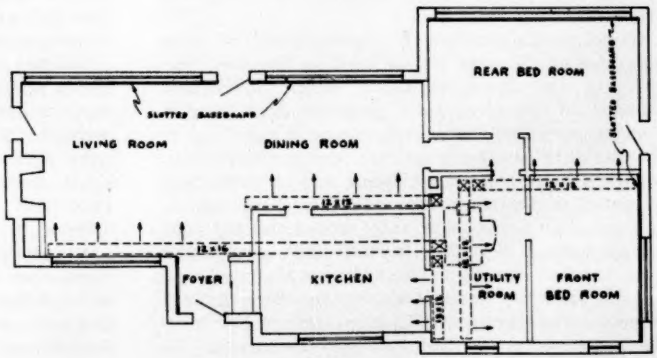
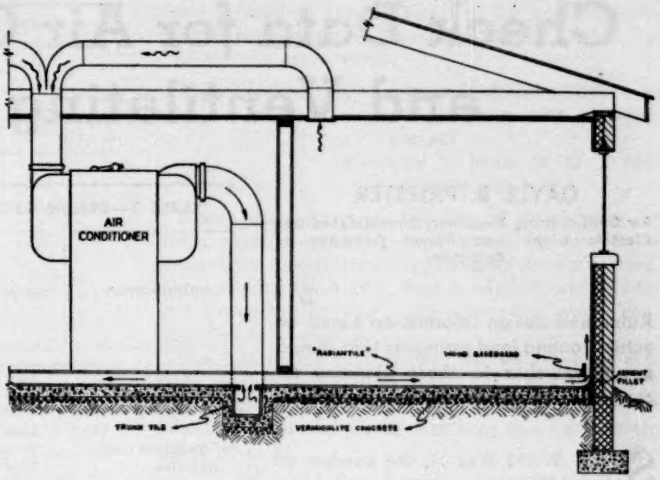


Fig. 1. Plan of main trunk tile runs.

Fig. 2. Cross-section through air distribution system.



to the outside walls where it is delivered vertically into the living space through a continuous slot in the top of the baseboard (see Fig. 1). Air is returned to the conditioner through an overhead duct system connected to grilles in the ceilings of the major rooms. Air delivery velocities average 130 fpm which is sufficient to blanket the outside walls and the many large picture windows with conditioned air. The total air circulated, 1,600 cfm, provides 7½ air changes per hour.

Air distribution is controlled by the use of separately dampered trunks to serve major portions of the house, and, in addition, local adjustment is effected by blanking off portions of the delivery slot in the baseboard with filler strips where desired.

A cross-section of the floor construction is shown in Fig. 2. The tile was laid on a vermiculite concrete base to reduce ground heat losses, and, in addition, the tile and its supporting slab were insulated from the foundation wall by one inch of rigid insulating board.

Performance of the system has been ideal. In the winter, with outside temperature at freezing and an average indoor air temperature of 72F at the 5-ft level, floor temperatures averaged 70F with minimum floor temperatures of 65F next to outside walls beneath picture windows. Air delivery temperatures did not exceed 88F under these conditions. The temperature 6 inches below the ceiling was held to a maximum of 76F. The absence of drafts throughout the living space was particularly apparent. In the summer the temperature distribution was even better. The floor felt comfortable to the touch all year around.

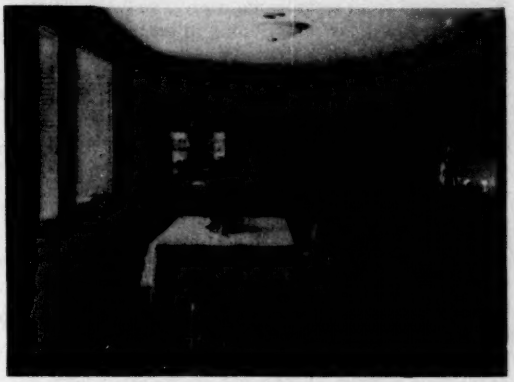


Fig. 4. Dining room with tile floor and baseboard vented under windows.

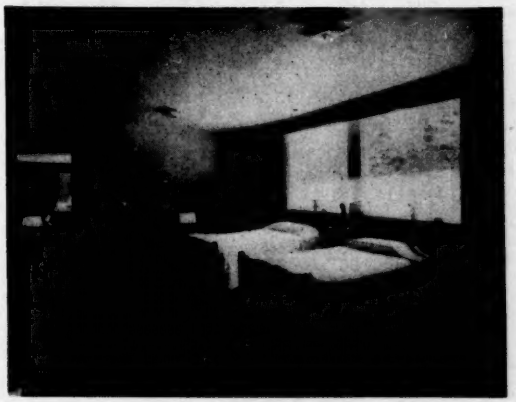


Fig. 3. Tile floor bedroom.

The only fault found with the system, and it was considered a minor one by the owner, was an odor reminiscent of a damp masonry basement which was noticeable at times during the cooling season. The odor disappeared entirely during the heating season and, whatever its cause, seemed definitely associated with masonry and dampness. Reports have been received from owners of somewhat similar systems, designed for heating only, that such an odor was present when the system was first turned on in the fall. In every other way the owners of the home consider the system perfect.

Experience has shown that the system described has real merit in home comfort control. The even temperature distribution and absence of drafts characteristic of radiant heating has been obtained without sacrifice of air filtration, summer cooling, or year-around humidity control.

Check Data for Air Conditioning and Ventilating Design

GAYLE B. PRIESTER

Air Conditioning Engineer, Consolidated Gas Electric Light and Power Company of Baltimore

Rules and design information based on actual cooling load estimates that should prove valuable to those planning air conditioning and ventilating systems.

SINCE World War II, the number of air conditioning systems installed has increased by leaps and bounds. Applications range from restaurants, stores, and theaters, where air conditioning in many areas is considered a business necessity, to apartments and libraries where it is looked upon as a desirable asset.

From the large number of air conditioning installations that have already been made, sufficient operating data are available for arriving at general figures (Table 1) for classes of commercial installations. The information is not intended to replace the careful heat gain calculations necessary in a particular air conditioning design. These data, however, do enable an engineer to obtain a broad general picture with reference to the areas and number of persons generally served, the range of size of unit commonly installed for such service, and the required power consumption. These data can also be used as check figures to substantiate particular design calculations.

The information was obtained from analyses of actual load estimates and from other sources. In most cases, outside design conditions were 95F dry bulb and 75 or 78F wet bulb; inside design conditions were 76 to 80F dry bulb and 50% relative humidity.

When the watts per square foot are higher than average, or the square feet per person are lower than average, the total load usually is higher than average.

Since people, lights, and outside air usually account for the greatest part of the cooling load, except for living quarters or industrial applications, the data in Table 2 are given to show the important effect that a change in these items has on the total cooling load.

For the average application, approxi-

TABLE 1—DESIGN DATA FOR COMMERCIAL AIR CONDITIONING.

Application	Range	Total Btu per Hr per Sq Ft	People per Ton	Cfm per Sq Ft	Sq Ft per Person	Watts per Sq Ft
Apartments and hotel guest rooms	Low	13	1.4	0.5	100	0.2
	Avg.	20	1.7	0.7	175	0.6
	High	30	2.2	0.9	325	0.9
Art museums and libraries	Low	30	2.5	0.9	40	0.5
	Avg.	51	4.3	1.6	60	1.0
	High	75	8.3	2.1	80	2.0
Bank areas	Low	35	2.5	1.1	26	0.9
	Avg.	53	4.7	1.8	53	2.9
	High	75	7.5	2.5	80	4.4
Barber shops	Low	45	2.9	1.3	20	0.6
	Avg.	73	4.9	2.6	40	1.4
	High	112	7.4	4.4	60	4.6
Beauty shops	Low	49	2.5	1.6	17	2.7*
	Avg.	75	4.3	2.3	42	4.2*
	High	114	7.1	3.0	75	9.3*
Clothing stores, children's	Low	39	1.4	1.1	48	1.1
	Avg.	41	3.1	1.8	96	1.6
	High	42	5.9	3.2	130	2.5
Clothing stores, men's	Low	33	1.2	0.9	60	1.0
	Avg.	45	3.0	1.4	118	2.2
	High	85	6.2	1.8	205	4.4
Clothing stores, women's	Low	30	2.5	0.8	22	0.8
	Avg.	43	5.7	2.4	61	3.3
	High	65	11.0	6.9	107	7.4
Clothing stores, general	Low	29	3.2	0.9	27	1.5
	Avg.	44	5.2	1.4	65	2.2
	High	68	7.0	2.1	111	3.5
Department stores, basement floors	Low	20	6.2	0.5	20	0.8
	Avg.	30	8.0	0.8	30	2.4
	High	39	15.0	1.2	95	3.9
Department stores, main floors	Low	25	2.0	0.9	16	0.7
	Avg.	42	6.0	1.3	35	2.5
	High	62	7.0	2.0	90	5.2
Doctors' and dentists' offices	Low	33	1.3	1.2	29	1.4
	Avg.	51	4.0	1.7	75	1.7
	High	68	7.0	2.4	160	3.4
Drug stores	Low	35	1.3	1.1	17	0.2
	Avg.	70	4.5	1.9	39	1.6
	High	109	6.9	3.4	92	3.9
Food stores	Low	44	3.0	1.3	12	0.9
	Avg.	82	5.3	2.5	36	2.6
	High	142	7.9	4.8	72	5.0
Offices, private and general	Low	22	1.2	0.7	32	0.6
	Avg.	43	3.5	1.4	105	2.0
	High	72	6.3	2.2	278	4.8
Restaurants	Low	62	3.4	0.8	9	0.2
	Avg.	115	7.0	2.1	18	1.4
	High	260	11.1	3.8	32	6.8
Specialty stores, miscellaneous	Low	22	1.1	0.8	20	0.9
	Avg.	52	3.1	1.9	90	3.9
	High	179	5.5	5.9	192	12.9
Taverns and night clubs	Low	25	6.6	0.8	8	0.2
	Avg.	80	8.6	1.4	18	1.1
	High	165	10.7	2.8	75	2.2
Theaters	Low	74	10.4	15.0†	6	0.1
	Avg.	92	16.0	20.0†	8	0.3
	High	115	19,0	30.0†	12	0.8

*For lights and equipment.
†Cfm dehumidified air per person.

TABLE 2—COOLING LOAD CALCULATIONS.

Application or Item	Btu/hr = (1) × (2)	
	Quantity (1)	Factor (2)
Theaters	No. persons	350
Quiet offices or living quarters	No. persons	400
Active offices or retail stores	No. persons	450
Drug stores or restaurants	No. persons	500
Lights	Watts on in room	3.4
Outside air (at 95F db and 78F wb)	cfm	43

mately 1 hp per ton of refrigeration is required for the refrigerant compression equipment. When the predominant load, as in theaters and taverns, is due to people, a lower refrigerant temperature is required to remove the high latent heat load caused by moisture from the occupants. Therefore, more than 1 hp per ton is required. Similarly, when a large part of the cooling load is sensible heat due to transmission, solar radiation, or lights, a higher refrigerant temperature can be used and less than 1 hp per ton is needed. The supply air fan power requirement is about 0.1 hp per ton of refrigeration.

Table 3 gives electric power consumption data based on actual installations analyzed for 95F dry bulb and 78F wet bulb conditions at about 40 deg latitude and near sea level. For different conditions and length of cooling season, these figures would have to be adjusted accordingly. Spaces are left to insert comparable figures for a local territory. Equivalent full load operating hours are included. (Also, see Table 4.)

In addition to electric power costs, there usually are water costs. If a water-cooled condenser is used, then from 1 to 2 gpm of water per ton of refrigeration are required. The colder the water, the less refrigeration tonnage is needed. The total water consumption cost for the season would be obtained by multiplying the total cooling load in tons by the operating hours from Table 3 times an average figure of 1.5 gpm times 60 minutes per hour times the cost per gallon (7.5 gal = 1 cu ft). In other words,

$$\text{Average water cost} = \text{tons cooling load} \times \text{hours} \times 1.5 \times 60 \times \text{cost of water per gal}$$

$$\text{or} = \text{tons} \times \text{hours} \times 12 \times \text{cost of water per cu ft}$$

Where restrictions on the use of water exist or where water is expensive, a water-cooling tower or an evaporative type refrigerant condenser should be used. These require about 10% more connected electric load and power consumption, but reduce the water consumption by at least 90%.

The installation cost of most air conditioning systems ranges from $300 to $1,000 per ton, the average cost varying for different applications and different localities. The cost per sq ft of floor area varies from about $1 to $4.

Ventilation

When air conditioning is not practical, some means of ventilation is necessary, particularly in the summer, to prevent the heat and odors in a space from accumulating and becoming objectionable, or to remove smoke and vapors. Often, natural ventilation aided by open windows and doors is sufficient. In many instances, however, the building structure is such that natural ventilation cannot satisfy the need, and some means of mechanical ventilation then becomes a necessary feature.

Exhaust fans may be installed to remove the hot or foul air. One item often overlooked and which causes a great deal of trouble is the fact that for every cubic foot of air exhausted an equivalent amount of air must come into the space. This is most important. When special means are not provided for make-up air to enter the space, the air enters through cracks around the windows, through doors, through stairwells, and through other places, usually causing draft complaints and troubles. In some cases, back drafts down chimneys have developed, resulting in incomplete fuel combustion. Separate supply air systems with heating

TABLE 3—POWER CONSUMPTION DATA—1947-48.

Installation		Hp Range	Annual Kwhr per Hp			Equiv. Full Load Operating Hours	
No. Used	Class		Range	2-Yr Avg.	Local	Avg.	Local
9	Restaurants	12-36	850-1,870	1,425		1,620	
4	Cafeterias	11-21	770-1,365	1,124		1,270	
15	Drug stores	3-13	516-2,101	1,021		1,160	
5	Jewelry stores	5-9	565-1,180	840		950	
8	Night clubs	15-47	410-1,190	827		940	
9	Dress shops	5-45	354-1,085	770		870	
11	Residences	3-11	111-1,229	661		750	
11	Theaters	35-60	327-1,300	618		700	
4	Large offices	45-60	490-1,018	547		620	
7	Ten-cent stores	40-140	344-978	527		600	
6	Shoe stores	all 3.5	270-782	526		600	
7	Beauty shops	5-8	287-745	510		580	
4	Small offices	all 5.5	264-580	441		500	
6	Recreation spaces	25-65	276-651	421		480	
9	Funeral parlors	10-18	108-572	187		210	

TABLE 4—AVERAGE PER CENT OF ANNUAL TOTALS.

Item	Apr.	May	June	July	Aug.	Sept.	Oct.
Electric power consumption	—	5	16	28	28	18	5
Degree hours, db, above 75F	2	6	21	30	26	13	2
Degree days, wb, above 65F	—	6	20	30	26	16	2

coils and filters usually are needed to offset the air exhausted from restaurant kitchens.

Most of the complaints regarding drafts occur in winter. If cold air enters around windows or through doors, it must be heated before it contacts occupants.

Also, supply air systems are sometimes installed without providing sufficient means for the air to get out of the structure. Therefore, the system does not work satisfactorily. Relief openings must then be considered.

When ductwork or filters are involved, a squirrel-cage type of blower must be used, since the ordinary propeller type fan cannot be used on much if any ductwork.

Proper use of exhaust hoods will reduce the total quantity of air required. The closer the hood can be to the source of contaminant, the less air is required. From 50 to 100 cfm per sq ft of canopy type hood is recommended. For vapors heavier than air, a canopy type hood should not be used, but a slot type hood is then required around the periphery of the tank.

Table 5 gives suggested air changes for general ventilation without hoods for various applications when air conditioning cannot be used. The volume of the space involved should be divided by the minutes air change indicated to obtain the cfm required.

Roughly, 1 hp per 9,000 to 18,000 cfm is required by a direct-driven propeller fan with free delivery. The actual value depends upon the fan design and operating speed. One hp per 3,000 to 6,000 cfm is required under reasonable conditions for a blower operating against ½ inch static pressure. Noise must be considered in many cases, and a large enough fan must be selected to deliver air required as quietly as necessary.

TABLE 5—AIR CHANGE RECOMMENDATIONS.

Application	Air Change	
	Summer	Winter
Offices	2 minutes	5 minutes
Stores	2 minutes	5 minutes
Kitchens	1 minute	2 minutes
Factories	3 minutes	3 minutes
Garages	3 minutes	6 minutes
Meeting halls	2 minutes	5 minutes
Churches	2 minutes	5 minutes
Theaters	2 minutes	5 minutes
Laundries	1 minute	3 minutes
Attic cooling	2 minutes	——
Cow barns	——	40-120 cfm per cow
Horse barns	——	30-200 cfm per horse
Poultry houses	——	½-2½ cfm per bird

Window Air Conditioners Serve Texas Restaurant

Although the compact, window-type room air conditioner was primarily designed for homes, offices and other comparatively small confined spaces, it seems likely that these small units may find wider applications. An example of the job these small package units can actually do can be found in the modern Home Plate Cafe in Del Rio, Tex., where five Frigidaire window air conditioners serve a large dining area, keeping it comfortably cool despite the blazing rays of a hot Texas sun. The cafe has an area of 1,848 sq ft.

The five units were installed by Crosby & Rust Co., Frigidaire dealers in the Del Rio locality. Air conditioning this restaurant presented more than its share of problems. The owner did not want a water tower on the grounds, nor on the roof of the building. To further complicate matters, a survey revealed that it was impossible to install the water tower, evaporative condenser or any other water-saving device anywhere within the building.

This finding very nearly created a stalemate because by all accepted standards, equipment requirements called for a 5-ton package air conditioner. Although this unit is easy to install as far as plumbing and electrical connections are concerned, it does require circulating water for operation, and, in an arid location, either a water tower or evaporative condenser is necessary to conserve water.

A slightly unorthodox solution was followed. Five 1 hp Frigidaire window room units were installed, with a combined refrigerating capacity equivalent to about 5 tons. These compact conditioners provide all of the advantages of the larger units, and they are more flexible. Air is cooled, filtered, dehumidified, and circulated throughout the restaurant. Fresh outside air can also be introduced into the conditioned space as required. In addition, there are two separate systems in each unit which can be operated independently, according to the amount of cooling needed. Also, one or all of the units may be turned on, depending on conditions as they develop in the restaurant.

Venetian blinds on the sunny side of the building help reduce the heat load. It was found that the air conditioners reduced the temperature from 95 to 83F in a single hour. Lights in the restaurant are not usually turned on until 6 or 7 p.m.

During the evening hours, only four of the units are required. At a recent dinner, which took place at 8 p.m., 54 guests remained comfortably cool for two hours with all fresh air ducts closed for 60 minutes. Normal operation calls for 20% fresh air.

Heat Pump Domestic Water Heater

G. GILL FREYDER
Sales Service Department, Commonwealth Edison Co.
Chicago, Ill.

This discussion of test data and experience gained from the field-testing of the heat pump water heater is from a paper presented before the Midwest Power Conference held at Chicago. Results indicate unit has desirable economic and operating features.

MOST heat pump discussions in the past 10 years have applied to equipment for heating and cooling homes or offices. It has overshadowed many other applications of the heat pump, equally as attractive, including the heating of water supply for domestic needs.

Satisfactory operation of the heat pump for heating water has been reported of a heat pump water heater built in 1934. This application was revived in 1946, and since then several utilities, electrical appliance manufacturers and research organizations have investigated its possibilities.

Technical Development

In the past few years a number of trial model heat pump water heaters were built and tested. The American Gas and Electric Service Corp. and some of its subsidiary companies believed that the device held sufficient potentialities and initiated an active research and development program. A number of performance tests were conducted during 1948 on 3 different developmental designs of heat pump water heaters to obtain actual performance data. Of the 3 designs tested, it was reported that a hermetically sealed unit mounted in the water tank offered the most promising possibilities. In a report (1)* the American Gas and Electric Service Corp. concluded that the heat pump water heater was readily adapted to a self-contained package device which could be manufactured by quantity production methods and techniques.

Appliance Manufacturer Activity

The electric appliance industry has not shown a great interest in the heat pump water heater. One established electric appliance manufacturer was for several years the only company to report any activity. Although its development program started in 1936, it was about 10 years later that it announced the development of a water heater that drew its heat from the surrounding air by means of a heat pump (2). Last year, it announced a heat pump water heater design of a radically different arrangement. It is reported the heater operated satisfactorily in the laboratory and now is to be field tested in a home.

*Numbers in parentheses, unless otherwise indicated, indicate references at end of article.

In 1948, the Utilities Research Commission (formed by Commonwealth Edison Co. and Public Service Co. of Northern Illinois to perform special research for its sponsors) issued a report (3) on research and development of an electrically driven heat pump for heating the domestic water supply. The heater was constructed in the laboratory with apparatus and materials available at the time and it was designed for study, testing, and further development.

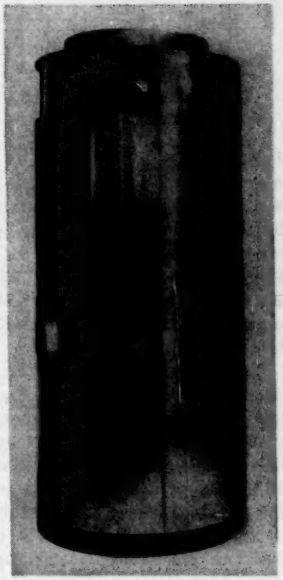


Fig. 1. Type of domestic water heater field tested.

The unit proper consisted of an 80-gal cylindrical steel water tank containing a copper condensing coil, a compressor connected by a single V-belt to a ½ hp motor, a thermal expansion valve and a fin-coil evaporator assembly. The refrigerant used was Freon-12. A fan mounted on the motor shaft forced air through the evaporator which extracted heat from the surrounding air and made it possible to pick up some of the heat losses from the motor and compressor.

After a period of laboratory testing, a heater was installed in a home to obtain field experience and comparative performance as related to an 86-gal electric resistance type heater. It operated successfully without mechanical failure except for the minor difficulties usually associated with new devices. It also supplied all hot water needs equally as well as the resistance heater. The kilowatt-hours required were approximately 43% of those used by the resistance type. In addition, it was found the heat pump unit served as a dehumidifier of the house basement during humid weather and aided in drying the laundry hung in the basement on rainy days. Experience gained from the heater tests indicated that further research and development work was justified.

Harvey-Whipple Unit

The initial investigation conducted by the Utilities

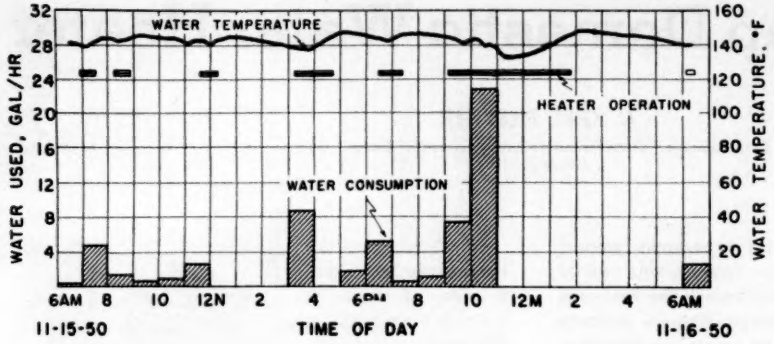


Fig. 2. Water consumption, water temperature and heater operation for a 24-hour period. Following data apply: Input, 4.94 kwh; water used, 59.1 gal; operating time, 9.3 hr; load factor, 34.3%; COP, 2.09.

Research Commission was so promising that a commercially built pilot model heat pump water heater was purchased for further study. The heater was built by the Harvey-Whipple Co., Springfield, Mass. In cooperation with the Joint AEIC-EEI Heat Pump Committee, they agreed to build 27 heat pump water heaters for field testing by utility companies. The remainder of this presentation deals with the testing of the Harvey-Whipple heater.

The Harvey-Whipple water heater has the appearance of a production model, Fig. 1, being self-contained and having all of its component parts hidden from view. The 53-gal cylindrical storage tank has a 1/3 hp hermetically sealed motor compressor unit mounted at the top of the tank to make use of motor and compressor heat losses to heat the water. The condenser is arranged vertically in the center of the tank and delivers heat to the water along its entire length. The evaporator, or heat pick-up surface, surrounds the top of the unit. Air is drawn in through the sides, over the coil, and is then discharged from the top by means of a small propeller type fan.

Test Procedure and Performance

The Joint AEIC-EEI Heat Pump Committee compiled a field test procedure (4) to enable comparable operating data to be obtained for all installations. The procedure was devised to allow for operation of the heater under normal residential conditions. This procedure was followed with a few minor changes.

The four measurements necessary for calculating the performance factor and for comparison with the other pilot models are: (1) total quantity of hot water drawn from the storage tank, (2) temperature of water entering tank, (3) temperature of water leaving tank during draw-off periods, and (4) total electric energy consumption of the unit during the test period.

Most of this information can be obtained with little difficulty. However, the record of hot water drawn from the storage tank is most important and in turn is most difficult to obtain. Much of the water drawn is in small quantities and at irregular intervals during the day. It is essential that these withdrawals be accurately measured. The ingenuity of the laboratory man was helpful in arranging for this measurement. It was accomplished by the use of a printing demand meter interconnected with the water meter in such a manner that a tape recording was made of water quantities withdrawn from the heater at 5-minute intervals.

Both operation and performance of the Harvey-Whipple unit were carefully observed since its home installation in March, 1950. Daily instrument readings were taken and operation compared with an exist-

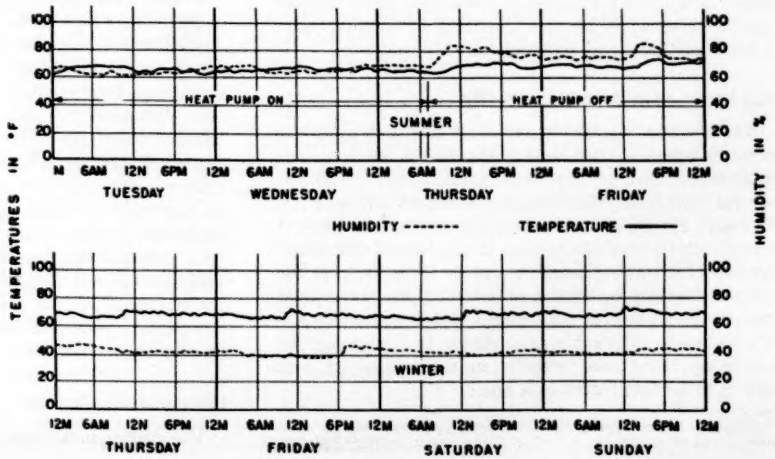


Fig. 3. Influence of heat pump water heater on basement temperature and humidity.

ing 80-gal resistance type electric heater. Table 1 gives a summary of the performance for an extended period.

Hot Water Capacity

The heater operated very satisfactorily and supplied an adequate quantity of hot water for the domestic requirements of a family of four. Delivered water temperature averaged from 120 to 145F, except when water was drawn in excess of heater capacity. Daily hot water withdrawals ranged from 30 to 100 gal and averaged 56 gpd. Operation for one day is shown in Fig. 2. Neither automatic dishwasher nor automatic laundry equipment was used in the home. It is recognized that the average home containing these electrical appliances uses 70 to 80 gpd of hot water. The test indicated the heater could adequately provide hot water for withdrawals up to 70 gpd and also revealed that withdrawals as much as 100 gpd at water temperatures within the accepted 120-145F range could be made, provided the water was uniformly used throughout the day. Fig. 2 illustrates an average day's operation.

Performance Factor

Depending on operating conditions, the heat pump water heater can deliver several times as much heat as is supplied to the motor in equivalent electric energy. It is this characteristic that makes the device attractive. The ratio of heat delivered to the heat equivalent of the energy input is known as the coefficient of performance (COP) or performance factor. Theoretically a heat pump water heater could deliver 8 times the heat of the energy supplied to the motor. Performance factors in the neighborhood of 4.5 to 5.0 have been suggested as practical. The COP, however, is materially affected by water temperature, refrigerating compressor design, and motor efficiency. Since it seems highly desirable to provide the domestic hot water supply at temperatures of 145 to 150F and use standard refrigerating parts, such values are difficult to obtain. Field testing of the Harvey-Whipple heater shows a COP of 2.14. A COP of 2 to 3 is all that can be expected at this time because of the mechanical losses in a heat pump system and present technical knowledge.

Test results indicate the daily consumption of hot water affects the performance of the heat pump water heater. Higher performance factors are obtained on

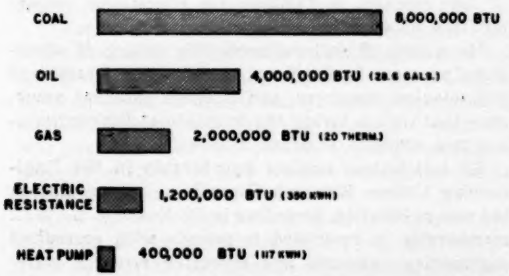


Fig. 4. Average monthly Btu input to domestic water heaters, using various heat sources.

TABLE 1—TEST DATA RESULTS.

Test period, days	91
Water consumption, gal	5117.7
Power consumption, kwh	427.0
Gal per kwh	12.0
Gal per day, avg.	56.3
Demand, watts	560
Basement air temperature, F, avg.	70
Water inlet temperature, F, avg.	67.9
Water outlet temperature, F, avg.	140
Load factor, %	34.7
Performance factor	2.14

days of greater hot water use, for a refrigerating system, because of its inherent characteristics, operates more efficiently at lower condensing temperatures. Large daily hot water draw-offs cools the storage tank and for a time allows better performance of the refrigerating unit at the prevailing lower water temperatures.

The performance factor is also influenced by stand-by losses. All water heaters have stand-by losses. Some are greater than others. Since the losses are included in the total power consumption, the calculated performance factor is adversely affected. The fluctuating hot water use and stand-by losses in the home have a material effect on the performance of the heater. Therefore, the COP of 2.14 obtained in the field tests is lower than those reported from laboratory investigations.

Dehumidification

An interesting and desirable characteristic of the heater is the dehumidifying effect of the evaporator coil, Fig. 3. Relative humidity values of 60 to 70% were maintained during the summer, at the time the heater was being tested. Such humidity conditions are very satisfactory and make for a dry, comfortable basement free from musty odors. It was also found that laundry hung in the basement dried very quickly. The unit had little or no effect on the basement temperatures. Heat infiltration from the outdoors during warm weather and the usual heat losses from the heating plant during the heating season were sufficient to provide heat for the heat pump and to maintain normal basement temperatures.

Summer Cooling

Another desirable characteristic of the heat pump water heater is the cooling effect that can be supplied as a by-product of water heating. The heater may be installed in the basement or utility room and used to air condition an adjoining room. Air from the room to be cooled is circulated through the heat pump unit by means of ducts. Heat is extracted from the air as it passes through the water heater to heat the water. The cooled air is then returned to air condition the room. The effect is the same as that derived from a portable room air conditioner. The equipment cannot be operated as a basement dehumidifier during the hours it is operating as a room cooler.

Some of the pilot model water heaters tested by

other utilities were installed in this manner so that the cooling effect could be determined. The cooling was found to be quite satisfactory during the time the unit operated to heat water. The lack of cooling was also noticeable when the unit was not operating. A redesigned heater is to have provisions for supplying cooling independently of water heating requirements. The unit will continue to operate to provide air conditioning after water in the storage tank has been heated to the desired temperature.

Operating Cost

The heat pump water heater offers all the automatic features and convenience of electrical resistance heating but with less kilowatt-hours and lower operating cost. Fundamentally it uses less energy than any other water heater, and therefore it is a means of conserving our existing fuel resources. Fig. 4 gives the average monthly requirements of such units. Tests in the home have shown that the Harvey-Whipple water heater will provide hot water comparable in quantity and temperature to that of the conventional electric resistance heater, but using 38% as many kilowatt-hours.

Water Heater Selling Prices

Economics, it seems, will control the immediate future development of the heat pump water heater. Indications are that the retail price of the heater will be 1½ to 2 times the cost of a conventional electric heater. This appears high when compared with the selling prices of other types of water heaters. However, when consideration is given to the fact that the device serves as a dehumidifier in addition to heating water and an allowance of $150 for a dehumidifier is made, the price seems more reasonable.

At the present time, only one manufacturer has produced a quantity of heat pump water heaters for test purposes. It is reported that other electric appliance manufacturers are interested in this type of heater and units may be commercially available in the near future.

Conclusions

Investigation and study by the Utilities Research Commission and by others indicates that the heat pump water heater has several very attractive features for the user and utility that warrant further consideration.

(1) It provides an efficient method of electric water heating.
(2) The demand for power and electrical energy consumption is less than for the resistance type heater.
(3) Operating costs at the regular residential rates are lower than the resistance heater on controlled water heating rates.
(4) The heater provides basement dehumidification and effective laundry drying.
(5) High load factor makes the heat pump water heater a desirable load for the utility.
(6) The first cost is not a major factor when dehumidification effect is evaluated.
(7) The attractive and desirable features of the heat pump water heater cannot be supplied by conventional water heaters.

References

(1) Progress Report on a Heat Pump Water Heater, by Philip Sporn and E. R. Ambrose, HEATING AND VENTILATING, February, 1949.
(2) The Heat Pump Water Heater, by W. F. Ogden, Southeastern Electric Exchange meeting, Atlanta, Ga., October, 1947.
(3) Heating of Domestic Water Supply by the Electrically Driven Heat Pump, by Utilities Research Commission, December, 1948.
(4) Suggested Field Test Procedure for Determination of Coefficient of Performance and Performance Factor of an Electric Heat Pump Water Heater, by Joint AEIC-EEI Heat Pump Committee.

Research Projects Under Way in Engineering Schools

More than 5,200 engineering research projects, representing annual expenditures of over $50.5 million, are now active in the engineering schools of American colleges and universities. These figures highlight the 1951 edition of the "Review of Current Research," published by the Engineering College Research Council of the American Society for Engineering Education.

The new book, which outlines the policies and activities of engineering research in the 91 colleges and universities holding membership in E.C.R.C., is the only complete guide to the current research contributions of engineering schools, according to Dr. Gerald A. Rosselot, chairman of the Research Council and director of the State Engineering Experiment Station at the Georgia Institute of Technology.

"The obvious result of these strong programs," Dr. Rosselot said, "is an ever-increasing flow of new basic information in the engineering sciences. Equally important, however," he emphasized, "is the contribution of this research in fulfilling the educational responsibilities of scientific and engineering schools.

"In a time of national need, this catalog of educational research is significant evidence of scientific and technological resources, and it offers excellent assurance that we are laying the foundations for maintaining this strength in years to come."

All institutions holding membership in the Engineering College Research Council are represented in the new publication, according to Dr. Rosselot. E.C.R.C. membership is restricted to schools with accredited engineering curricula and extensive research activities in the engineering sciences. A total of 91 institutions are now active.

To Zone or Not to Zone

LEWIS SMITH
C. A. Dunham Co., New York, N. Y.

The opinions of the author, urging moderation and unbiased engineering analysis in the approach to problems in the zoning of heating systems, are based on his own personal experience. Comment on controversial matters is invited. Examination is made of exposure factors, and some alternatives to zoning are proposed.

IN the last 10 years or so there has been a lot of talk—perhaps too much—about zone control for central heating systems. Just what are the merits of zone control? When and how should it be used? Building owners and consulting engineers should ask these questions and make every effort to obtain unbiased answers. It may be that energetic and not too well trained sales engineers have promoted "zone control" as a catch phrase without proper knowledge and experience, being animated largely by a desire to swell the size of an order by the inclusion of added and often needless equipment.

That the idea of zoning is often being grossly overdone is evident to the writer from inspection of many plans and specifications, and from observation of many buildings both with and without zone controls after operation over a number of years. To bring the practical considerations before the trade is the object of this article.

To make clear what we are talking about, the term *zone control* is meant to indicate the splitting of the heating system in one building into several sections, each section being supplied through a control valve automatically varying the supply of heating medium, be it hot water or steam, in response to some thermostatic control device exposed to the weather and designed to maintain uniform indoor space temperatures. The term is not used in this article to apply to projects having a number of buildings supplied from a central plant, wherein each building is fed through a single control valve, as in a housing project. It applies only where two or more control valves are used in the same building.

It should be a cardinal principle of designing engineers, and most emphatically of building owners and managers, to keep all mechanical and electrical equipment as simple in design and as limited in extent as possible. Except in buildings or projects of considerable size, it is usually not possible to pay for employees who are qualified to give complex equipment the intelligent attention it deserves.

Even the best control devices do not operate perfectly at all times without supervision and maintenance. An intelligent operator can make them produce results even beyond the claims of the maker—a poor or careless operator can ruin them. Too often devices which look good on paper and which actually are capable of doing an excellent job, just don't produce under the particular circumstances of installation or maintenance to which they are subjected. Far too many originally good control installations have been neglected and finally have lapsed into complete disuse, a sheer waste of initial investment and a disregard of the saving in fuel cost which could be obtained every year with proper attention.

Since the foregoing remarks apply to the installation of even a single control device, their force would be multiplied when applied to controls for multiple zones. Hence, zone control should be considered first from this viewpoint: Who is going to operate it?

A second consideration is: How much will be gained in fuel economy and tenant comfort to compensate for the extra cost of zoning?

Lastly: Why zone at all?

Generally speaking, there are three basic criteria governing arrangement of multiple zones in a building:

(1) *Occupancy.* An office building in which the heat may be shut off at, say, 6 pm may have stores on the ground floor which requires heat till, say, 11 pm. Obviously the stores should be on a separate zone. Many other needs for occupancy zoning are encountered and need not be enumerated here as they are self evident.

(2) *Physical size.* To put the whole building on one main and one control valve may lead to cumbersome sizes. Splitting the system into two or more zones may actually reduce installation cost. Also, a building may cover such a great area that using low pressure steam (2 lb) may lead to excessive pipe sizes which could be reduced by distributing at a higher pressure of 10 or even 30 lb with control valves at several points. Unfortunately, this matter of size is occasionally distorted or exaggerated by inexperienced or unscrupulous salesmen to cover up real or potential deficiencies in their equipment. A number of control devices now on the market are so designed that they will not operate satisfactorily except in small buildings or in small zones of a large building. The salesman, knowing this and wishing to avoid service calls and expense, indulges in a song and dance about the value of a lot of zones. Too often he sells the idea to the consulting engineer and, what is worse, to the owner who has to live with the job ever after.

(3) *Exposure.* It is often argued that different exposures of a building require separate zones. Here there is logic but also a lot of room for argument. The main purpose of this article is to discuss the actual need for exposure zoning.

There are, of course, other considerations which sometimes come up, such as zoning for stack effect in a skyscraper, for special requirements for ventilating and cooling, or for process work in industrial plants,

but these are reasons which must be studied for individual jobs and do not form a part of this article.

We all agree that the various sides of almost any building require different amount of heat at different times according to the state of the weather. But how much of a factor is this difference in heat demand and how is this variation in heat supply brought about?

In most localities, though not all, one side of a building is exposed to cold winds to a greater extent than any other side, as local weather reports will show. In this country, the northwest is usually the cold side, and that is the side which also gets little if any sun during December and January. Other sides are also exposed to various combinations of wind velocity and duration, and temperature, so that on some days the southeast side may actually need more heat than the northwest. The natural thing to say is, "Let's have a separate zone for each side of the building and we'll meet all weather conditions at all times." Theoretically that is all right, and in a square building we can have four zones very easily, although translating a layout on paper into an economical and properly operating system is not so easy, as will be explained later. In many buildings, however, four zones represents that multiplicity of equipment which, as we mentioned earlier, should be avoided.

In an oblong building the short sides may be so small that a compromise is effected, as shown in Fig. 1, by splitting diagonally into two zones. The compromise is obvious—two exposures are on one zone. But we have

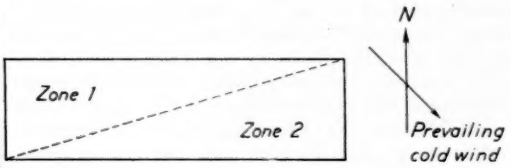


Fig. 1. Simplest zoning problem and solution.

reduced the amount of equipment by 50% with little or no sacrifice in results, which is a step in the right direction.

Actually the majority of buildings are not so regular but are built with ells, wings, and bays. Consider a common layout, as shown in Fig. 2.

Each wing now has three exposures. Common sense tells us we should not have a zone for each of the 20 walls, but we can make various combinations of walls and have, say, six zones. There is still an undesirable multiplicity of equipment, and a lot of compromising has been done to get down even to six zones, by putting walls of dissimilar exposure on the same zone. This could be corrected by a multiplicity of mains to pick up similar exposures on the same zone but at a fabulous cost in piping.

A further compromise might split the building diagonally as indicated by the dotted line. But then, what do we gain by two zones? Well, perhaps we could reduce the heat somewhat on the generally southerly zone as compared with the other zone, with due regard to the fact that each zone has three exposures on it. In view of the simplification of equipment, the end result over a period of years might justify the extra

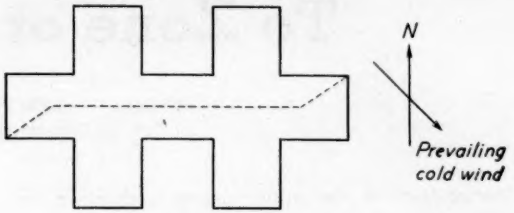


Fig. 2. A common building layout.

cost of two zones, although even this is open to question, as will be explained later on.

It can safely be asserted that for exposure alone, the average large building will seldom need more than two zones, regardless of shape. A qualification to that statement is that if the building happens to have walls that are principally glass, the sun effect may require additional zones.

Gain from Two Zones

There are two principal reasons advanced for zoning for exposure—sun effect and wind.

In an example city, like New York, continuous heating is seldom required before Oct. 1 and after May 1. Between those dates there is an average daily sunshine of 6 hours and 12 minutes. Hence, sunshine is a factor only 26% of the time, and if the first and last 1½ hours are discounted owing to the angle of the sun, the average is only 3 hours and 12 minutes, or about 13%. Related to the usual 12 to 18 hours of heating, the average effective time is only 18 to 27%. During the severe months of December, January and February the percent is considerably less; and in spring and fall considerably more, resulting in more overheating in mild weather.

Even during the few hours when the sunshine is strong, the people mainly affected by it are those sitting or working in the direct rays. Where two people are working in an office, for example, one at a desk in front of a window, the other sitting between windows, the former may swelter while the latter is only comfortable. The only cure is for the one in the sun to move out of the sun or pull the shade down. Thermometers in the room, shielded from the sun, will show little if any change when the sun comes out or is obscured by clouds. The rate of heat loss through the walls will, of course, tend to slow down after prolonged intense sunshine due to the rise in temperature of the outer surface. But this decrease in heat transfer is much too slow to have any appreciable immediate effect on room temperatures. Heat passing through glass areas and being absorbed by floors and furniture will tend to cause a more rapid rise in room temperature; and should the building have walls of clear glass, the sun effect would be so great as to require a separate zone. At the present time, such buildings are the exception and not the average construction we are talking about.

On the whole, it can be said that with ordinary glass areas and wall construction the sun effect is too small to warrant zoning.

Calculating the dollar value of zoning for sun effect is rather simple and quite enlightening. Not more than one-half of a building can be overheated by the sun at any one time. The extent of overheating has been found by tests on a few jobs to be five degrees, but let's play safe and exaggerate this to eight degrees. Starting from scratch this means an average of four degrees for an average time (as previously calculated) of 3 hours 12 minutes, but to be still further on the safe side let's assume that the stored heat in the rooms is not dissipated as the sun gets low but that there is an "over-ride" of 2 hours. This gives us a total average time of overheating of 5 hours 12 minutes. If we are talking about an apartment house where the heat is kept on 18 hours per day, this is 29%. Now, for a climate like New York City the mean winter temperature is about 42F. If we figure on heating to 72F, our average heating range is 30 degrees. The overheating of four degrees is therefore 13.3%. So we have 13.3% overheating for 29% of the time for 50% of the building, and this works out to 1.93%. The reader may differ with some of these percentages but stretch them as you will (within reason) the answer will still be very small.

Now, heating calculations cannot possibly be accurate within anything like 2%, yet it was necessary to exaggerate to arrive at even that figure. So isn't it perfectly safe to discard zoning for sun effect for any cash return it might yield with investment?

Wind has a far greater effect than the sun. Taking New York again, between Oct. 1 and May 1 the wind blows from the eight directions as shown in the following table.

Direction	Duration, % of Time	Average Velocity, Miles per Hour
N	14	15
NW	27	21
W	16	17
SW	13	14
S	9	15
SE	5	13
E	8	9
NE	8	10

Now we have a factor of importance as to effect on room temperatures. Heat transmission through the walls is somewhat increased, and infiltration is greatly increased, in proportion to the velocity. In addition, the infiltration on a windward wall may entirely kill the infiltration on the leeward wall. Where this condition is as marked as it is in New York City, compensation must be made in the design, but the question is, should this be done by zoning or only by the use of a proper exposure factor in figuring radiation.

Exposure Factor

Using an exposure factor means that balanced temperatures are achieved only when design conditions exist. For all other conditions there will be some unbalance in room temperatures, and this unbalance may be as much on a still day as on a windy day. Applying an exposure factor merely averages things, but experience shows that the departure from average, eliminating a few extreme conditions, is only a matter of perhaps five degrees, and when that is figured as being only plus or minus 2½ degrees it doesn't sound like much.

Examining the New York City report, we find that the wind blows on an average from a westerly to northerly direction 57% of the heating season at an average velocity of 18 miles per hour, as against a southerly to easterly direction 22% of the time at 12 miles per hour. This makes it evident that if the radiation on the west to north sides is increased over that on the south to east sides, the temperatures in all rooms will be in reasonable balance over one-half the time and that moderately unbalanced conditions will exist less than half the time. The application of the proper exposure factor is therefore desirable and may suffice for practical purposes.

If a central control of the proper type (the word "proper" will be enlarged upon later) is used, a reasonably uniform temperature can be maintained in all rooms regardless of exposure. An exception to this statement is that during times of very low temperature coupled with high wind velocity a reasonable balance cannot be achieved, but weather reports show that such combinations of temperature and wind do not exist for any great length of time nor very often. It does not seem logical to design the system for those infrequent extreme conditions.

As to the exposure factor to be used, opinions vary widely, from the ASHVE Guide, which doesn't give it much weight, to the Heating, Piping & Air Conditioning Contractors National Association which puts great emphasis on it. The Committee on Standards of that association has published a report on heat loss calculations which is the most painstaking study of the problem yet made. Incidentally, it takes no account of sun effect. But this report seems to be written more from the viewpoint of protection to the contractor so that he will be sure to install enough radiation to maintain 70F whatever the direction or velocity of the wind, or the temperature. The most severe conditions are taken and only January and February are considered, without regard to average conditions or the problem of maintaining balanced heating in the building.

From the viewpoint of trying to hold uniform temperatures in the heated spaces it does not seem logical to follow that principle. For New York City, for instance, the report recommends 50% more surface on the N, NW and W sides than on the S, SE and E sides. Granted that conditions can arise to cause this difference in heat loss, it seems to the writer more logical to deal in averages rather than to distribute the radiation to guard against infrequent need and thereby suffer unbalanced heating for the average condition. Then when these rare extreme conditions do arise, the steam pressure or water temperature can be raised above normal, and if necessary the heat can be kept on all night. Those steps will take care of situations which, when they do exist, are not of long duration. An exposure factor for New York of 25% rather than 50% seems more logical, and even that factor may be high.

Another approach to this problem, and one which is

particularly applicable to most areas in this country which do not have the extreme wind duration and velocity of New York City and to large housing projects having a number of identical buildings with varying orientation, is to figure radiation without any exposure factor. Install a central control system without zones. Orifice each radiator valve and size these orifices not only for pressure drop and radiator size but for exposure of each room. In other words, tailor the radiation to fit the job by means of orifices instead of amount of surface installed. The simplification of layout and installation, with reduced cost, is quite evident.

Since heat loss calculations are usually based on a 15 mile per hour wind, it will obviously be necessary to increase the rate and duration of heat supply above normal at times of extreme weather conditions.

Another good idea to use in place of zoning on such jobs is to install convectors with dampers. If a radiator valve is the only means at the disposal of the occupant to reduce room temperatures, he is reluctant to close the valve because he knows that shutting the heat off entirely is too much of a reduction. Instead, he is apt to open the window slightly and waste heat. But if a damper is available, he can set this in some intermediate position to get partial reduction of heat to maintain comfortable room temperature. Thus, if at times he finds his room overheated he can take care of that situation nicely.

So far, New York City has been used as an example. In the table prepared by the Committee on Standards, New York has among the highest exposure factors, being exceeded in this respect by only four other cities and equaled by four more, out of a list of 46 cities in 27 states and the District of Columbia. It is interesting to note that cities like Detroit, Grand Rapids, Green Bay, Wis., Ithaca, Albany, Syracuse, Salt Lake City, Birmingham, and Portland, Oregon, are given exposure factors which are negligible within the scope of this article.

It can be safely stated that if proper consideration is given to the exposure factor according to the location of the building, either through sizing of the radiation or by proper orificing, satisfactory results can be obtained in almost any large building of usual construction and occupancy with one central control valve. One qualification should be added to this statement—the word "proper," which has been used before in this respect, should be used to describe the control system.

Proper Control

To discuss what is and is not a "proper" control system is to introduce a controversial matter. There is one phase of this problem which is in the nature of a truth and not opinion. It is well known that if heat is turned on and off periodically it is difficult, even with accurate orificing, to achieve uniform distribution of heating medium to all radiators. The larger the system the greater the difficulty due to the time lag in flow between the nearest and farthest radiator. Therefore, when contemplating a single control valve for a building of any size, only those systems operating on the "continuous flow" principle should be accepted as coming within the scope of the word "proper." To overlook this feature is to invite operating trouble. As to hot water, the pumps should be run to maintain continuous circulation.

The consulting engineer who, finding that multiple zones mean expensive piping and equipment, abandons that idea in favor of a single control valve, need not feel badly. After all is said and done, it is a matter of dollars and cents. Bear in mind that only from ¼ to ½ of the building is overheated at any one time. Several zones may save some fuel, less than 5%, but this saving is contingent on the control being kept in proper operating condition which too often is not the case. Against this rather limited saving are the high initial and maintenance costs. The balance financially may be and often is against multiple zones.

Caution

In cases where two zones have been decided upon, one for the exposed section of the building, the other for the protected section, a word of caution is necessary to avoid the disappointment of spending this extra money and getting nothing in return.

If the control operates from an outdoor thermostat, it must be realized that such thermostat should not be placed where the sun will hit it. Should this be done, every time the sun comes out the thermostat will be overheated and shut the heat off entirely. That is not what is wanted. What is wanted is to reduce, not cut off, the heat. Hence, the thermostat must be shielded from the direct rays of the sun. This eliminates a good part of the value of two zones because a shielded thermostat is largely affected by air temperature only.

It must be remembered also that such thermostats may not be affected by wind velocity sufficiently to step up the heat supply proportionately to the extra infiltration caused by an increase in wind velocity. Devices and combinations of devices to be automatically and fully sensitive to wind direction and velocity and to translate these factors into the amount of heat being supplied have been tried, but they are far too expensive, delicate and intricate for commercial use.

The only sure way to make two zones give different and correct amounts of heat, as between the windward and leeward sides of a building, is to supplement the basic outside control with indoor thermostats in each zone. Granting that proper locations can be found for these thermostats, they can be connected into the control circuit in such a manner as to modify the action of the outside thermostat. Now, if the cold side tends to underheat or the warm side to overheat, these indoor thermostats will step the heat up or down as necessary to maintain a uniform room temperature all over the building. The problem is, of course, to find locations for these indoor thermostats. In apartment houses and hotels this may be very difficult and even impossible. In commercial buildings it is relatively easy.

The builder should not delude himself into believing that he is going to get the results he expects out of zoning unless indoor thermostats are included. He will as a rule be better off to forget zoning entirely unless he is willing to spend the money for a proper job.

Corrosion Characteristics of Various Duct Materials

Ductwork for handling the exhaust of fumes from open tank operations is subject to a variety of corrosion influences. J. W. McWilliams, Eastman Kodak Company, presented a discussion of the corrosion resistance of ducts at the Chemical Engineering Conference of the 14th annual meeting of the Industrial Hygiene Foundation. Following is an abstract of Mr. McWilliams' remarks.

OPERATING conditions are important in considering duct material for exhausting fumes from an open tank operation. For a typical production operation, there are as many as eight different solutions that may be used in the tanks. Ductwork for collecting fumes carries a mixture of all fumes, mists, and vapors, which impinge in concentrations entirely uncontrolled. Installations are usually hard to inspect, and poor workmanship may go undetected until premature failure occurs.

The effects of corrosion in a duct are severe for a number of reasons. Acid fumes mix with water vapor to form dilute acids and mists which contain salts that may precipitate on the walls of the duct. The temperature of the duct is often lower than that of the solution and condensation of fumes may occur.

A logical procedure is to provide a duct system which, while it may not be impervious, will suitably resist the system fumes for a reasonable period of years. Some attention to future possible use of the tanks should also be given.

Common materials in use are those readily available to the sheet metal and carpenter trades, such as black and galvanized steel, aluminum, and wood. Other special materials that can be handled by these trades are stainless steel, wrought iron, plywood, asbestos wool, and others. Limitations of each of these materials may be overcome by protective coating, but use of protective coating is limited by application techniques in the shop and field. Actual choice of materials is affected by availability, expected exposure, expected life of the installation, skill of available labor for construction, allowable expenditure for the project, possibility of fire, or hazard to personnel.

A survey was made by questionnaire to various industries to obtain a background of data regarding the

RESISTANCE TO CORROSION OF MATERIALS USED FOR EXHAUST FANS

CLASSIFICATION — APPROXIMATE SERVICE LIFE
E - Excellent — Over 5 years
S - Satisfactory — 2 to 5 years
F - Fair — 6 months to 2 years
P - Poor — 6 months
Combinations — Variable performance

	STEEL	ALUMINUM	GALVANIZED STEEL	CAST IRON	BRASS	LEAD	ASPHALT PAINT	VINYL RESIN PAINT	RED LEAD PAINT	HOT ASPHALT	PHENOLIC RESIN BAKED COATING	HARD RUBBER LINING	SOFT RUBBER	NEOPRENE	EVERDUR	KOROLAC	PRESSED WOOD	AISI 316	ACID BRONZE
ACID DIPPING, PICKLING AND STRIPPING	E-P	S		E		E	S-P		E		S	E	E-S	E	E	F			P
ALKALINE CLEANING	E-F	S	E	E			E-P				S	E-S		E	E	F		E	
ANODIZING	S-F	S					E	E	E		E	E		E					
COATING — ENAMEL AND LACQUER	E	E			E						S			E					
DECARBONIZING	E-S				E		P					E			E	F			
DEGREASING AND METAL CLEANING	E-S		E-S		E														
HARDENING AND QUENCHING	E-S		E-S																
PLATING	E-P	S		E			E-S	S			E-S	E	E	E					
WASHING AND RINSING	E-P	E		E			S-P			S		E		E			F		

Paddle wheel type fans are normally recommended for all services where materials are carried in the air stream, as the blades stay cleaner and are less likely to corrode. The casing of the paddle wheel type fan is heavy, will last longer, and is more accessible for cleaning than the lighter casings normally used on forward curved blade and backward curved blade fans. Cleanout doors and bottom drains are recommended on all fans on open tank operations. Larger size curved blade fans are very suitable when casings two gauges heavier than normal are used. The deposits which build up on fan wheels and casings should be removed by regular cleaning. Repaint where any coating has been broken and removed.

RESISTANCE TO CORROSION OF MATERIALS USED FOR HOODS AND DUCTS

CLASSIFICATION — APPROXIMATE SERVICE LIFE
E - Excellent — Over 5 years
S - Satisfactory — 2 to 5 years
F - Fair — ½ to 2 years
P - Poor — 6 months
Combinations (EP) — Indefinite rating

	SEE FOOTNOTE 1	GALVANIZED IRON	BLACK IRON	STAINLESS STEEL	MONEL	LEAD LINING	ALUMINUM	HARD RUBBER	NATURAL RUBBER	PRESSED WOOD	NEOPRENE	TERNE PLATE	BUNA S	KOROSEAL	ASPHALT: PAINT ON IRON (ALLY OR BLACK)	ASPHALT: HOT DIP GALV. IRON	ASPHALT: 3-COURSE FELTED ON METAL OR WOOD	ASPHALT: PAINTED PRESSED WOOD	PHENOLIC RESIN: PAINT	PHENOLIC RESIN: BONDED PLYWOOD OR REDWOOD	PHENOLIC RESIN: BAKED OR SOLID CAST RESIN	ASBESTOS CEMENT BOARD OR TUBE	VINYLITE RESIN TYPE PAINT
ACID, CHROMIC (PLATING AND ANODIZING)		E-P	E-P	S		E-S				S-P	S	S			P				S-F	P	E-F		
ACID, HYDROCHLORIC		F-P	P	E	S	F		E	E-4		E	F	E	E	E-F	S		S		F	E-P	F	E-4
ACID, HYDROFLUORIC		P			S				S						S						E		
ACID, NITRIC		P		E		E					E				F-P	F					F		S
ACID, OXALIC (ANODIZING)					E	S	E								S								
ACID, SULFURIC		P	P	S-5		E-6		E	E-7	P	E	S			E-P	S	F		F	E-S	E	E-5	E-P
ACID DIPPING AND PICKLING (HORIZ. DUCTS)															P	F	E						
ALKALINE CLEANER (CAUSTIC 140°-180° F.)		E-P	E-P	E						S	E				E-S			S			S	E	
ALKALINE CLEANING SOLUTIONS	2	E	E	E							E				E								
ALKALINE PLATING (Cu, Cd, Ag)		E-P	E-P							E	S				E-S			S			S	S	S
PLATING AND ANODIZING (HORIZONTAL DUCTS)															P	S	E						
PLATING, BRIGHT NICKEL		S-P	S-P								S				E			S					S
PLATING AND DIPPING (VERTICAL DUCTS)		P													F					E			
TANNING, DRESSING, DYEING, BLEACHING SOL.		S-8							S-9														
WATER, BOILING AND STEAM		E-P	S-P	E	E						E				E-S	E						E	S
DECARBONIZING AGENTS	3	E																					
DEGREASING COMPOUNDS: ORGANIC AND MINERAL SOL.		E	E																				
ENAMELS AND LACQUERS (COATING AND DIPPING)		E	S																				
FABRIC IMPREGNATION		S																					
SALT, SUPERSATURATED SOLUTION 300°-400° F.		S	S																				
WIRE INSULATION		S																					

FOOTNOTES

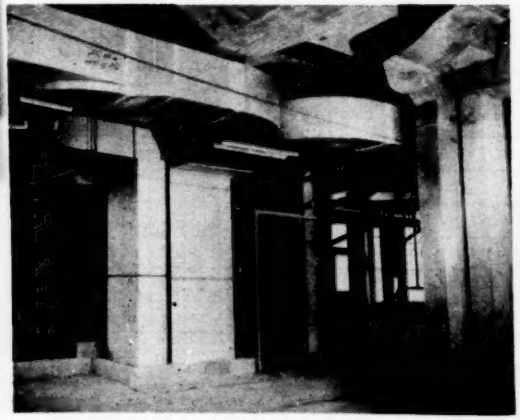
1. Ratings are based upon collated field service reports. Indefinite ratings are given where reports are inconsistent due to varying operating conditions (such as dilution, exposure to weather, etc.). Blank spaces denote insufficient information, not poor service.
2. Mild soaps, detergents, water soluble oils, 140°-180° F.
3. Creosote oil, kerosene, ethylene dichloride.
4. To 20%: E; 50-70%, 150° F.: S.
5. To 50%, Plating: E; 20% anodizing, agitated 80° F.: S.
6. To 50% plating: S; over 50% pickling, 20% anodizing: E.
7. 5-22%, 135°-215° F., pickling: S; plating, pickling, anodizing: E.
8. Except acid.
9. Acid.

resistance to corrosion, materials used for hoods and ducts, and materials used for exhaust fans. A summary of results is presented in accompanying tables.

The tables represent the experience of a great many companies and are not based upon theoretical recommendations. The tables leave considerable room for judgment by an engineer designing an exhaust system.

Mr. McWilliams' presentation is a preview of work done for the American Standards Association Z-9 Committee on Exhaust Systems in connection with the revision of the American Standard Code for Safety in Electroplating. This work is sponsored by the American Industrial Hygiene Association, American Society of Heating and Ventilating Engineers, and the National Association of Fan Manufacturers. Final result will be the formation of a new American Standard Code for Safety and Ventilation of Open Surface Tank Operation. The complete paper is available in Transactions Bulletin No. 14, Industrial Hygiene Foundation.

New Chemistry Building for Argonne National Laboratory



Trunk and branch ducts in typical wing of new lab by Austin Co. for Argonne.

Diffuser arrangement in lab wing before installing ceiling tile. Note service pipe clusters.

Outstanding Lawsuits

of interest to heating and air conditioning contractors

LEO T. PARKER
Attorney at Law, Cincinnati, Ohio

RECENTLY a reader asked this important question: "Can an insurance company refuse to pay a loss to a policyholder who proves that he relied upon a statement made by the insurance company's agent?"

The answer to this question is, "yes." This is so because the higher courts consistently hold that an ordinary or special insurance company's agent is not a legal representative of the insurance company, but the legal agent of the insured.

Not Liable for Agents

In Smith v. Mutual Fire Insurance Co., 33 N. W. (2d) 206, it was shown that an insurance policy contained a clause to the effect that the policy would be void if assigned without consent of the insurance company. Later the insurance company's agent advised the insured to assign the policy. This was done.

The higher court refused to hold the insurance company liable for a subsequent loss, saying that an insurance company is not liable for acts or promises of its agent.

This court also explained that one who holds an insurance policy must read it and know what it contains and cannot rely upon promises made by the insurance company's agent.

Risk is Increased

Another important point of law, regarding insurance, is that an insurance company is relieved from paying a loss if the testimony shows that the insured increased the normal risk originally assumed by the company.

For example, in Ziebarth v. Fidelity & Guaranty Fire Corp. of Baltimore, Maryland, 41 N. W. (2d) 632, it was shown that one Ziebarth operated a small repair shop in his residence. Ziebarth held an insurance policy which insured his building against fire loss. One day a fire caused a serious loss but the insurance company refused to pay the amount of the loss on the grounds that use of the property for business purposes invalidated the insurance policy. Ziebarth sued the insurance company but the higher court refused to hold the latter liable, saying:

"The policy described only the dwelling house. There is no evidence of intent to cover anything else except 'private structures' appertaining to the house . . . The evidence shows that the services of the shop were open to the public. It is our conclusion that the use as a repair shop open to the public destroyed its character as a private structure and excluded it from the coverage of the policy."

This court also explained that Ziebarth could have had a valid policy and the insurance company would have been liable if Ziebarth had written the insurance company explaining that he was using a part of his premises for business purposes. Then the insurance company would have issued a rider giving Ziebarth consent to so use his property.

Guarantee v. Fraud

Considerable discussion has arisen from time to time over the legal question: Can a contractor or seller of heating equipment completely relieve himself from all liability on verbal guarantees by inserting in a written contract a clause that all verbal guarantees and statements made by the seller are hereby cancelled? The answer is, "no."

For example, in Traylor Engineering & Manufacturing Co. v. National Container Corp., 70 Atl. (2d) 9, it was shown that a manufacturer made a written contract to sell a corporation certain heating equipment. This contract contained this clause: "The company (manufacturer) will repair F. O. B. works where made or furnish without charge F. O. B. its works, a similar part to replace any material of its own manufacture which within one year after shipment is proven to have been defective when shipped . . . No other warranty expressed or implied, concerning the subject matter of this contract, shall bind the company (manufacturer) without its written consent, duly executed by one of its executive officers."

The purchaser refused to pay the contract price for the equipment and the manufacturer filed suit.

During the trial the purchaser contended that it was fraudulently induced to sign the written contract on verbal statements made by the seller's agent to the effect that the equipment would operate economically and without trouble with the temperature control; and that automatic controls would take care of other operation.

The manufacturer defended the suit on the grounds that the above mentioned clause in the contract clearly relieved it from any and all liability for verbal guarantees and other statements. The higher court refused to agree with this contention, and said:

"Though one party (manufacturer) to a contract may stipulate away his liability for breach of warranty he may not do so for fraud which induces the other purchaser to enter into the agreement."

In other words, this court clearly held that while a clause in a written contract may relieve a seller from ordinary verbal guarantees, such clause will not relieve the seller from fraudulent statements which induced the purchaser to sign the written contract.

Also, see Omar Oil and Gas Co. v. Mackenzie Com-

pany, 138 A. 392. This court explained that a very thin legal line divides statements which are, from those which are not, actionably fraudulent. Also, this court held that before a seller is liable for fraud, the purchaser must prove all of these facts: (1) A representation. (2) Its falsity. (3) Its materiality. (4) The seller's knowledge of its falsity or ignorance of its truth. (5) His intent that it should be acted on by the person and in the manner reasonably contemplated. (6) The purchaser's ignorance of its falsity. (7) His reliance on its truth. (8) His right to rely thereon. (9) And his consequent and proximate injury.

For further comparison, see White, 240 N.Y.S. 123, 126. Here the testimony showed that a heating contractor represented to a property owner that a heating plant would adequately and satisfactorily heat his premises, that it would give much better heat than coal; that it would heat the building to 70F in zero weather; that the fuel oil required to produce adequate heat in the building would not cost more than 8 to 10% in excess of the coal required in the system then in use upon the premises, and would, in no event, exceed $350 for the season.

In subsequent litigation the higher court held that, irrespective of contents of a written contract, the seller or contractor could not collect payment for the heating system which he installed in the building. This court said:

"There is an allegation that the plaintiff (contractor) knew that said representations were false. What was said could easily be understood to relate to the inherent capacity, character, and quality of the system, and what it was actually capable of doing. That being so, they could be made the basis of an action in fraud."

Hence it is quite apparent that a heating contractor cannot avoid the consequences of fraudulent verbal statements, although the written contract contains a clause that the heating contractor shall not be liable or responsible for falsity or untruth of verbal statements or guarantees.

Salesman v. Broker

According to a recent higher court there is distinct legal differences between brokers and salesmen, as to collection of agreed commissions on sales. In other words, although a broker is entitled to a commission on a sale once he brings the buyer and seller together, this is not the law with respect to ordinary salesmen.

For example, in Shaw v. Jimmie Walker Home Appliances, 43 So. (2d) 700, it was shown that the owner of the Jimmie Walker Home Appliances made a contract with a salesman named Shaw to sell commercial refrigeration and air conditioning on a commission basis of 10% of the sale price to the purchaser. Shaw learned that a new building was being erected and stopped at the site to ascertain the name of the persons for whom the building was being erected. Later he brought the owner of the building into the office of the Jimmie Walker Home Appliances to figure the cost of one 15-ton air conditioning unit. This day the owner of the building refused to sign the contract or place the order, saying the price was too high. Some two or three weeks thereafter the Jimmie Walker Home Appliances sold to the building owner two 15-ton units on a basis of cost price, plus twelve percent.

Shaw sued the Jimmie Walker Home Appliances for the agreed 10% commission.

In holding that Shaw could not recover, the higher court said:

"A broker is a middleman or a negotiator between two parties. I am unable to see in this case that plaintiff (Shaw) occupied that position. He was strictly a salesman. Under his contract of employment he was to do more than to bring the parties together. He was in the category of a salesman and not entitled to any commission until he was instrumental in completing a sale on behalf of his employer."

This court also explained that the leading and essential difference between a salesman and a broker is that the former hires his services exclusively to one person, while the latter is employed to make bargains and contracts between other persons in matters of trade, commerce, and navigation.

Contractor May Recover Payment

In an interesting letter from a heating contractor, he wrote:

"About two months ago a woman phoned me in my office and asked me to come out to her home. I did so and she had me make some sketches for installation of a heating system. I prepared the sketches which she said were not satisfactory. Later she came into my office with other ideas for sketches which I made. She was pleased and said she would have me do the work. Later she had another contractor do the work. Her lawyer has informed me that I can collect nothing. Can I collect my money?"

The answer is: This contractor can collect the reasonable value of his rendered services. This is so because one who performs any kind of services can collect, although at the time the services were requested the building owner did not agree to pay for such services.

For example, in Doup Ice Co. v. Almand, 207 S. W. (2d) 601, the testimony showed: Officials of the Doup Ice Co. requested one Almand to draw plans and specifications for rebuilding the Doup Ice Company's plant which had burned.

Almand furnished the ice company with rough drawings of the plan of construction contemplated. The parties held several conferences in which a complete understanding was reached regarding the kind of materials to be used in the building and other details of construction.

Almand sued the ice company to recover the amount $720 he would have earned on the job had the company officials fulfilled the verbal agreement. The higher court awarded Almand $720.

Mistake is No Excuse

According to a recent higher court a heating contractor cannot avoid liability of failure to fulfill the exact terms of an installation contract, on an excuse that he made an error in figuring his bid.

For illustration, in Harris v. Lillis Co., 24 So. (2d) 689, the testimony showed that a contractor made a written offer to furnish and install equipment in a residence for an agreed sum of $300. The contractor refused to do the job claiming that he had made a big error when submitting the $300 bid. The building owner than had the work performed by another contractor for $662.

The higher court rendered a verdict of $362.00 in favor of the building owner and said that a contractor cannot avoid liability for failure to perform a contract on the ground of a mistake. The court held the contractor liable for the difference between his erroneous bid and the amount paid the second contractor.

Contractor's Materials are Destroyed

Considerable discussion has arisen from time to time over the legal question: If a heating contractor makes a contract to furnish materials and labor for an installation or alteration contract, who must bear the loss if the materials are destroyed or stolen after being delivered to and accepted by the property owner? The answer is: The contractor must suffer the loss.

For example, in Kopald Co. v. Mandan, 37 N. W. (2d) 253, the testimony showed these facts: A contractor delivered materials to a building intending to make installation within a day or so. The building owner took possession of the materials for the contractor. That night a fire destroyed the building, including the contractor's materials and appliances.

In subsequent litigation the higher court held that the contractor must bear the loss. The court said:

"When the contractor is to furnish the materials and labor for the performance of a contract requiring erection or installation, the materials generally remain the property of the contractor until they are affixed to the building of the owner."

Law of Used Heating Equipment

Considerable discussion has arisen from time to time over the legal question: What is the legal duty of a heating contractor who installs used or second-hand heating equipment? The answer is: One who installs used heating equipment must perform good workmanship, otherwise he cannot receive any payment for either labor or materials. Furthermore, he is not liable if the equipment is defective, unless the testimony shows that he issued either a verbal or written guarantee. See Fitzgerald Co. v. Schaefer, 216 S. W. (2d) 939.

Act of God

Recently a higher court held that neither a heating contractor nor a gas company is liable in damages for injuries or death caused by an Act of God.

For illustration, in Brown v. Atlanta Gas Light Co., 170 Fed. (2d) 91, the testimony showed facts, as follows: Until the year 1935 a college dormitory was heated and supplied with hot water by stoves using coal as fuel. During that year a heating contractor converted the hot water heaters from coal-burning to gas-burning appliances. The gas fumes were vented by running a pipe into the chimney of the dormitory. For ten years after installation of the gas water heating appliances no injury or harm had resulted from their use. The evidence showed that the venting system had worked properly and that no carbon monoxide accumulated.

One night a student's death was caused by asphyxiation from carbon monoxide fumes which escaped from the venting system into the dormitory in which he was sleeping. The boy's father sued for damages.

During the trial, testimony was given proving that the morning after the tragedy two employes discovered that the flue in the chimney into which the vent pipes entered was completely blocked by a pile of debris, consisting variously of stone, mortar, soot, and a large number of dead birds known as swallows, or chimney-sweeps. Before the tragedy occurred there had been an unusually heavy rainfall, an Act of God, in the vicinity, which had washed the soot and debris further down into the chimney. In view of this testimony the higher court refused to hold the boy's father entitled to recover damages. The court said:

"We are of opinion the evidence here failed to present any actionable issue of negligence on the part of the defendant. . . ."

This court decided that the chimney had been stopped up or blocked by an Act of God—the heavy rainstorm.

Also, see Amarillo Gas Co. v. Walsh, 257 S. W. 291. This court held that an Act of God is any unanticipated force of nature, and that neither a heating contractor who installed equipment nor a gas company which supplied gas is liable for resultant injuries to persons or property.

Books as Evidence

According to a recent higher court, a heating contractor's books will be relied on by a court to prove an amount owed by a creditor if disagreement arises over the amount owed by the creditor. And, according to a recent higher court, a contractor may prove the amount due by sale slips showing charge sales.

For example, in Paine Plumbing & Supply Co. v. McMurtray, 34 So. (2d) 676, it was shown that a plumbing and heating contractor purchased supplies and materials to the time of his death. The seller sued the contractor's estate for $3,009. The seller's books were not kept in a regular manner, but the higher court ordered the contractor's estate to pay the bill, since the seller produced as evidence the original sale slips which proved that the contractor owed $3,009 for supplies.

Full Payment

According to a recent higher court if a building owner or other purchaser gives a chattel mortgage to finance the contract price for heating equipment, the contractor cannot lose money if he forecloses the mortgage and then sells the heating equipment for less than the amount due on the mortgage. In other words, the purchaser must pay the deficiency to the contractor.

For example, in Nelson v. Bank of America, 173 Pac. (2d) 322, the testimony showed that one Nelson had a deposit credit in a bank of $1,200. He purchased certain equipment paying a small down payment and financed $2,500, the balance due, by giving a mortgage, with interest. Nelson did not make the agreed payments and after a considerable period he owed the mortgagee $3,731, counting interest. Then the mortgagee foreclosed his mortgage and sold the equipment to the highest bidder for $2,300. The evidence showed that the costs of sale amounted to $514. Thus the mortgagee received ($2,300 less $514) or a total of $1,786 to apply on $3,731, the balance due.

In subsequent suit the higher court held that the mortgagee could apply Nelson's $1,200 in the bank to the difference between $3,731 due on the mortgage and $1,786 netted on sale of the equipment; that Nelson must pay the additional $745 yet due the mortgagee or the difference between $3,731 owed by Nelson and $1,786 netted from sale of the equipment, and $1,200 taken from Nelson's bank account.

Damage Award Too Low

Considerable discussion has arisen from time to time over the legal question: Will a higher court hold a contractor liable in damages for injuries to persons or property caused by the contractor who allows use of property when he knows the job is incomplete due to the impossibility of obtaining efficient and proper materials? The answer is yes.

For example, in Gill v. Eakin, 33 So. (2d) 821, it was shown that a contractor furnished and installed certain gas equipment in a private dwelling. Certain risers, or pipes which should have been sealed were left unsealed. In other words, the contractor's employes failed to seal the risers in a small unoccupied room because sealing material was impossible to get.

When the home owner opened a closed door of the small room, the residence was practically blown apart due to the explosion of gas seepage from the riser. The wife was horribly burned and, after lingering in great mental anguish and physical agony for approximately fifteen hours, she died at a hospital. The husband also was badly burned and hurt, suffered excruciatingly, and was hospitalized.

The husband sued the contractor for damages. The jury awarded $10,000 damages. The husband appealed to the higher court and proved that he had paid total expenses for hospital, medical, and doctor's services, of $3,025.69. The higher court held the amount of damages inadequate, saying:

"We are convinced the compensatory damages awarded appellee (husband) were not adequate. . . . The judgment of the trial court is affirmed as to liability of appellant (contractor) for compensatory damages, but remanded for a new trial as to the amount (damages) thereof."

Air Conditioning Cuts Losses in Photo Supplies

Aside from the usual benefits of air conditioning, the controlled temperature and humidity (both summer and winter) prevents deterioration of the sensitized printing paper which constitutes a large percentage of the sales of Acme Photo Supply Co., Lima, Ohio. A 5-ton Typhoon packaged unit was installed.

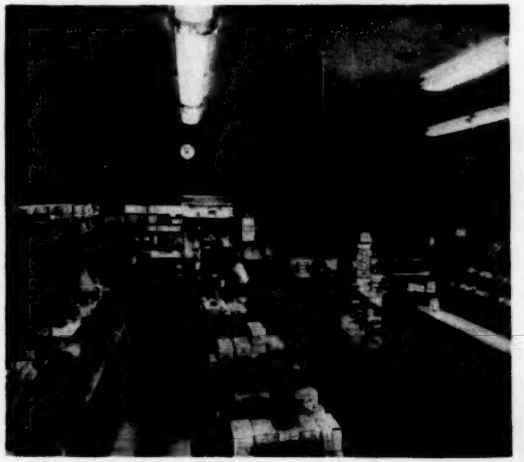
Photographic paper is dated by the manufacturer, and must be destroyed or sold at greatly reduced prices after the stamped date. This calls for a very close control of inventory, since it is equally important not to run out of paper by keeping inventories too low. The owner's experience in a previous store, which was not air conditioned, was that outdated film had practically no value. Even when sold at reduced prices, it would often be returned for refund by customers, resulting in bad feelings and the complete loss of the film's original value.

With controlled temperature and humidity throughout the year, the film remains in good condition even after the expiration date. Although it must still be sold below the regular price, refunds have been almost entirely eliminated. This enables the owner to maintain larger inventories without fear of serious loss, and to boost sales by virtue of his wider selection of papers and better supply at all times.

A relative humidity of 50% is maintained all year—in the winter by means of a Typhoon spray humidifier, solenoid valve and humidistat. The heating coil in the unit is controlled by a modulating steam valve and a modulating thermostat.

Because of the large area of single glass display window across the front of the store, finned tube radiation was installed under the window to boost heat at the front of the store, and to keep display windows from fogging due to the high internal relative humidity during cold winter months.

The air conditioning unit has been painted to blend in with the store interior, which includes harmonizing pastel walls, limed oak showcases, fluorescent lighting and Hollywood spots. Komminsk Refrigeration, in Lima, was responsible for the installation.



Interior of air conditioned photo supply store.

Experience is my Classroom

By T. W. REYNOLDS

EDITOR'S NOTE. Mr. Reynolds continues the subject of servicing, trouble jobs, maintenance and similar problems.

How Service has Shrunk

On the other side of the picture, it is a fact that many troubles on a job are due to the careless and disinterested service man who is thinking of other things. He does nothing but upset the work of others. I recall, though, an era when a service man came whistling to work with a happy look on his face and pride in his work. If the boss made a profit he was not unhappy about it. Most of this is now a matter of history. Today a worker has the union as his boss and is indifferent in spite of high gross pay and the fact that even his net earnings may be greater and will buy more luxuries, essential things and comfort than they did for his father. Nevertheless, the psychological effect of high prices and income tax deductions depresses him in view of his increased wants and desires.

So today when I call up a well-known fuel oil company for help, they send a service man to fool around my oil burner for hours. If he is a younger man he will perhaps still leave the trouble behind, but if a second call is put in for help an older man may come, one born in a previous era. If so, he will quickly put his finger on the trouble and soon depart. I then pay for the time of both men, because the fuel oil agency bills for both, and they do after all have to pay both men. They are only selling fuel, and service to them is but a necessary evil. The first service man was in reality one of their truck drivers sent around because no one else was available. He is the same man who never puts a rag on my road to catch the spill of dripping parts when filling my oil tank.

Vibration Isolation and Knocks

An engineer may specify vibration isolation for a compressor and later find the motor so much out of line with the compressor that the Freon piping is vibrating in spite of its flexible connectors and piping supports and braces. Again, it may be that the isolation is nullified by a rigid conduit to the motor within the concrete floor and then rigidly connected to the motor. The concrete will then receive the vibrations and pass them along.

Don't be too quick to take down an air compressor to locate knocks supposedly within it when it may be that a 2x4 left in an air receiver during construction is just telephoning back along the connecting pipe to the air compressor. Such timber will pulsate with the compressor's air delivery, but may be easily removed through the manhole on the air receiver, or it may wear itself to shreds with time. Knocks do occur in the cylinders of some machinery, but sometimes they are easily overcome by removing pliers left behind.

Out of Balance Equipment

A store decides to install only one centrifugal refrigerating compressor (no spare), because the record from other stores shows but few shutdowns for repairs. Then the store decides to go still further and put both present and future refrigeration requirements into the one compressor, because one machine of, say, 540 tons can be bought cheaper than two of 270 tons each. The compressor, being in a penthouse atop the structure, and much oversize for present conditions, then vibrates on light load during mild weather. At such times it does the job on first position (there are eleven positions) and because of this, not only vibrates but whines as well. As the weather grows hotter, the load increases, the second or higher position is then used, and there are no more troubles. Meanwhile, the noise and vibrations are stopped by increasing the load on the machine through opening of the almost closed outdoor air dampers to the units.

An air conditioning system may not function as it should because the compressor, cooling tower, and chilled water and cooling tower pumps are not selected for synchronizing with one another under existing loads, although they may cooperate fully as future loads are imposed with building enlargement. However, for the the time being there may be too much of the future in some of the equipment. Certain equipment may be in one machine and sized for present loads. Other equipment may be in two machines and sized for future loads, with or without a spare. Still other equipment may have over-capacity, depending upon selection of the nearest available commercial size.

In spite of such equipment selection, it may still be possible to operate satisfactorily. For example, under present load, the running of two oversize cooling pumps is not necessary and may cause difficulties. Only one should be used, or if both are operated, they should be throttled down by their respective valves. When cooling tower pumps are started there is a delay in the water dropping over cooling tower troughs to the basin. Meanwhile, too much water is taken from the cooling tower water basin by the suction of the two oversize pumps. The water in the basin is then lowered below the suction strainer and it draws air. Sometimes a sleeve may be placed around the overflow to allow the water level in the basin to rise about 1 inch.

(The question of servicing will be continued in this department in a subsequent issue.)

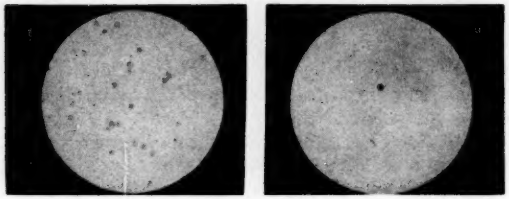
PRODUCT APPLICATIONS

New, Unusual, or Ingenious Uses of Equipment and Materials

Panel Filters Remove Pollen

PROBLEM: In many environments, both at work and at home, pollen allergies are a serious detriment to both comfort and efficiency.

SOLUTION: Research Products Corp. has found through a series of tests that panel type filters are effective in removing ragweed pollen from an air stream. By setting up a means of collecting a representative sample of pollen both upstream and downstream from a test filter and arranging to introduce ragweed pollen in measured amounts, Carl B. Rowe, chief research engineer, was able to demonstrate efficiencies in the order of 90 to 99%. The efficiencies were based on microscopic examination of slides introduced in the air stream in such a manner as to collect a proportionate sample of pollen both upstream and downstream from the filter.



Unfiltered Filtered

RESULTS: A ½-inch R-P Fiber Self-Seal filter reduced the entrained sample pollen by about 96%, while a 2-inch filter of the same type reduced the entrained sample pollen by about 99%. Photographs show pollen distribution on slides upstream and downstream from the filter.

Jet Test Chambers Reproduce All Weather

PROBLEM: A new aeronautical turbine laboratory at Trenton, N. J., under construction for the Navy, will be specifically designed to test Navy jet engines and will require five testing chambers. Two chambers will be altitude chambers.

SOLUTION: A contract of approximately $1.2 million was awarded in December, 1949, to Mehring and Hanson Co., of Arlington, Va., using York refrigeration equipment. The refrigeration plant, designed and built by York for the air treating systems, will develop 7,200 hp in producing the severe test conditions.

RESULTS: Expressed in terms of air conditioning, the refrigeration capacity for this project would be sufficient to provide air conditioning for nearly three million square feet of building space. Test chambers for jet engines will subject equipment to all types of weather and altitude conditions.

Refrigerated Warehouse Exhibits Flexibility

PROBLEM: In the new Merchants Refrigerating Co. plant outside Minneapolis, Minn., it was required to provide freezing capacity for 100,000 pounds of poultry a day and low temperature storage for 21,000,000 pounds of food.

SOLUTION: A specially designed ammonia refrigeration system by Carrier will include nine heavy duty reciprocating compressors and will supply both chilled brine to the storage areas and direct expansion ammonia cooling for the blast freezing tunnels. The temperature range will be from —30F in the tunnels to —10F in more than a million cubic feet of freezer storage and will be 35F in the rest of the storage space. Six of the compressors will be assigned to the low stage of the two-stage system. All six will discharge into the same intercooler and any of the low stage compressors may be used for either the brine or the blast freezing. The same brine may be used for both the 35F and the —10F storage areas, with difference in temperature maintained by modifying flow rates. One of the three high stage compressors will be a standby unit.

RESULTS: Present plans call for freezing both poultry and meat. Tenant facilities will be provided in the warehouse for preparation of foods to be stored. The eighth commercial refrigeration warehouse to be opened by the Merchants Co. is now under construction and will be an ultra-modern plant.

Parking Lot Office Air Conditioned

PROBLEM: The parking lot offices at the Skirvin Hotel in Oklahoma City were uncomfortably hot in the summer where outside design conditions are 100F dry bulb, 78F wet bulb.

SOLUTION: The James Hotel Corp., owners of the establishment, installed an Acme Flow-Cold liquid chiller and a cooling tower in the building which consists of two-level parking at the present time. Chilled water is circulated for summer air conditioning and forced air convectors are used for the outlet of conditioned air. The load is approximately three tons.

RESULTS: Performance has been very satisfactory to date.

Smoke Stack Wastes Filtered Through Fiber Bags

PROBLEM: When production began on a new type of carbon black at a midwestern plant, stack losses of the extremely fine particles were so great that the plant's recovery unit dropped 60 to 70% in efficiency. Yields were low and the firm began operating at a loss.
SOLUTION: As a remedy, the firm tried a secondary recovery system using the bag filtration method. Fabrics used in early attempts failed and the system fell into disuse until several fabrics of synthetic fiber were tested. Tests indicated that DuPont Orlon acrylic fiber filled the bill. A commercial size bag filter unit using Orlon fiber bags began operating in 1948 and other Orlon bag filter units were installed recently.
RESULTS: The filters collected the 10 to 15% of carbon black that was formerly being lost. The bags have withstood high temperatures and acid fumes. The bags have exhibited fair resistance to weak alkalies, and are not harmed by common solvents, oils, greases and most acid salts. Bags have to be changed less than those of other material.

Building Addition Spurs Cooling

PROBLEM: A novel construction project is designed to triple the size of a large Dallas office building by erecting a new 17-story unit alongside and on top of the existing building. The entire structure is to be completely air conditioned.
SOLUTION: A Carrier conduit Weathermaster system was installed and centrifugal compressors will provide chilled water to a total of 590 room units. The new machine is a 600 hp unit. Two other centrifugals were already in operation in the building.
RESULTS: Entire structure, including a theater and 200,000 square feet additional rental facilities, will feature air conditioning in a building addition scheduled for completion early in 1952.

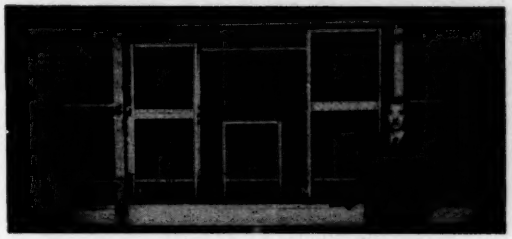
Waterproof Coating Preserves Monument

PROBLEM: A monument erected on Chestnut Ridge in the Allegheny Mountains above Uniontown, Pa., is a huge steel cross which looks out over seven counties. One of the maintenance problems was to keep the surface corrosion-free and reflective to light from floodlighting at night.

SOLUTION: The George V. Hamilton Co. of Pittsburgh, sprayed the 60-foot metal edifice with mica insul-mastic, a brilliant, white, long lasting, waterproof coating.
RESULTS: The coating will prevent the cross from rusting and at the same time reflect floodlighting at night.

Waterless Refrigeration System

PROBLEM: In the establishment of Schaller and Weber, New York meat retailers, an extensive air conditioning and refrigeration system was contemplated, but recent experience with water shortage precluded the use of water as a cooling medium for coils.
SOLUTION: Seven Unicons, products of the Kramer Trenton Co., were installed. Services supplied were complete air conditioning of the store, a —30F freezing room, a 40F meat processing room, two 36F walk-in refrigerators, a 0F walk-in refrigerator and a 38F display case. The seven direct expansion units totalled 11½ hp. Conditions required the installation of the units outside the building in a brick foyer adjacent to the processing room. Units are mounted on angle-



Refrigeration units on built-up platform.

iron frames built up from a wooden platform structure. A shed was built over them to protect the units from the weather.
RESULTS: Direct expansion units completely eliminated use of water. Installation costs were reduced by ability of the units to withstand outdoor weather in an unheated shed.

Cellular Glass Insulates Ceilings Without Support

PROBLEM: Because of large thickness of insulation required in low temperature installations (below 50F) the insulating material is usually applied in two layers. Prior to a new development at Pittsburgh Corning Insulation Research Bureau, various sorts of mechanical anchors were employed to fasten the lower layer of insulation to the top layer.
SOLUTION: Work at the Bureau makes possible a method of applying the lower layer of cellular glass insulation to ceilings without mechanical support. Tests indicate that an average bond strength of 55 pounds per square inch between layers of cellular glass is assured. Although mechanical anchors are required to hold the top layer of insulation to the ceiling, a lower layer of insulation can be adhered with hot asphalt. The receiving surface must be flat and even to insure proper bond, and the lower layer of insulation must be applied to the receiving surface before the hot asphalt is set.
RESULTS: Time required for application of the second layer of insulation is greatly reduced and installation is made without supports.

Abstracts AND Reviews

Publications abstracted in this department should be ordered direct from publisher.

HANDBOOK OF OIL BURNING

After approximately six years of preparation, the Oil-Heat Institute of America has published its Handbook of Oil Burning. It was prepared under the direction of Frank H. Faust, editor-in-chief and G. Theodore Kaufman, editor, plus a group of 48 top men in their respective fields who wrote the 54 chapters of the book. The industry has gone far since the Drake well was completed in 1859.

In 1931, the American Oil Burner Association, later taken over by the present association, published the first Handbook of Oil Burning, a volume of 625 pages. In 1945, G. T. Kaufman, OHI technical secretary, published Basic Service Text: High Pressure Type Burners. And now after a long lapse, there is a completely new book—Handbook of Oil Burning.

The various chapters are grouped in 9 sections, each in charge of an associate editor. These sections are: oil as a fuel; combustion of fuel oil; preparing oil for combustion; oil burning equipment; elements of the heating system; controls; selection of equipment; application, installation and maintenance of oil burners; and standards.

Although termed a handbook, it is a comprehensive text covering this widely expanding field. The illustrations are well-chosen and easy to follow. In all, this volume is recommended to the technical men interested in the general field of oil burning.

Handbook of Oil Burning, edited by F. H. Faust and G. T. Kaufman. Cloth bound, 6 x 9 inches, 978 pages. Published by Oil-Heat Institute of America, 6 E. 39th St., New York 16, N. Y. Price, $10.

FLUID DYNAMICS AND FLUID MACHINERY

The objective of Advanced Fluid Mechanics and Fluid Machinery, by R. C. Binder, professor of mechanical engineering, Purdue University, is to bridge the gap that has existed between the usual first treatment of the subject and the advanced problems and reference material. Actually, it is an extension of Dr. Binder's Fluid Mechanics.

This volume is divided into three main parts—fluid dynamics, fluid machinery, and fluid dynamics. Part 1 deals with features of fluid dynamics important in practical engineering work. The engineer who is concerned with such problems as the selection, operation, and design of a machine, will find much of interest in Part 2. It is concerned with the dynamic type of fluid machine. It has information about common machines and shows applications of fundamental ideas and relations previously presented. While Part 3 is an extension of Part 1, it is somewhat more analytical because of the greater complexity of flows. Included is a chapter on vector analysis.

This book is an outgrowth of course work presented at Purdue University over a period of years. While certain mathematical techniques are introduced, it is not overstressed. At the end of each chapter is a list of selected references for supplementary study.

Advanced Fluid Dynamics and Fluid Machinery, by R. C. Binder. Cloth bound, 5¼ x 8¼ inches, 426 pages. Published by Prentice-Hall, Inc., 70 Fifth Ave., New York 11, N. Y. Price, $8.

PIPE WELDING

As the result of six years' work by a committee representative of companies and engineers interested in the subject, the Heating, Piping and Air Conditioning Contractors National Association has issued the second edition of its Standard Manual on Pipe Welding. The first edition was published in 1931 and consequently because of the rapid advances in the art in the intervening 20 years, much of the material in the book had to be rewritten.

It is written primarily for the piping contractor and discusses the parts of his business that is concerned with welding. The book is well prepared and the information is easy to follow.

The subject matter has been grouped into the following chapters: Welding—a tool of the contractor; description of welding processes; welding equipment maintenance; selection and training of operators; scope of pipe welding; materials and filler metals; testing and inspection; code welding; templets and jigs; layouts and fabrication details; estimating pipe welding costs; coordination of facilities; fabricating shop organization; field welding shop organization; alloy and stainless steels; aluminum and aluminum alloys; copper and copper alloys; nickel and nickel alloys; cast iron; lead welding and burning; hard facing materials; welding terms; welding symbols; tables and formulas.

Standard Manual on Pipe Welding. Cloth bound, 6 x 9 inches, 506 pages. Published by Heating, Piping and Air Conditioning Contractors National Association, 1250 Avenue of the Americas, New York 20, N. Y. Price, $7.50.

DISTRICT HEATING HANDBOOK

When first published in 1921 as a working manual of heating practice, it was titled Handbook of the National District Heating Association. Since that time, there has been a second edition and now the third edition is published—completely rewritten to incorporate the wealth of material available and to take into account

(Continued on page 118)

What Would You Do?

Replies to engineering and operating problems of interest to the industrial plant engineer

This Month's Problem

What is a good empirical rule-of-thumb to use in figuring the hourly air change in a textile mill in the summer? This air change should be only that caused by infiltration and exfiltration around and through doors and windows and through walls of a completely unconditioned mill. What would be the effect on such air change of the increased vapor pressure inside the mill caused by mechanically introduced water vapor, as in a standard humidifier system?

DO you have an industrial plant problem that you would like to see treated in this department in order to get the help of engineers who may have the necessary skill and experience to suggest a solution? Or perhaps you may have some comments to problems currently discussed. In either case, the Editor would welcome your letter.

In the box on the top of this column is the industrial plant problem that is discussed in this issue.

Replies Received

There is no satisfactory rule-of-thumb method of figuring air change in a textile mill in summer. Even with all windows and doors closed, the natural rate of ventilation will depend upon building construction and dimensions, wind direction and velocity. In an air conditioned mill, such natural ventilation rate is not important because the rate required and maintained by the air conditioning system is ordinarily greater. The latter must be computed from the thermal data and requirements for each particular case. In view of the fact that air change maintained by a well designed air conditioning system is produced under a slight plenum, natural ventilation is rendered inoperative and therefore unimportant.

The increase in vapor pressure inside a mill humidified by a direct humidifying system has in itself no appreciable effect on the ventilation or air change.

Fitchburg, Mass. — *Parks-Cramer Co.*

Any rule-of-thumb is not believed reliable for figuring the hourly air change in a textile mill during the summer. On some of the jobs we have figured, we have found from 4 to 11 natural air changes per hour in a building. This all depends on the amount of window area and the placement in the path of maximum wind direction.

There is an additional natural ventilation means where a single-story building has windows on both sides and a monitor with windows located in the center of a pitched roof. This additional effect is the stack or flue effect.

Because windows are open, infiltration and exfiltration play no part at all in this picture, for windows are the major source of ventilation. It becomes necessary here to figure the total amount of window opening area on one side of a mill. Of course, there must be the same opening on the other side. In any event, the smaller area must be the one taken into consideration.

The average wind velocity must then be reduced to feet per minute and from this, multiplying the wind velocity in feet per minute, times the total area, times a coefficient which is roughly around 60%, should give the approximate value of the cfm passing through the area. Dividing this factor by the volume of the room will give the air change per minute which can then readily be changed to air changes per hour.

A modern windowless mill would have to have some kind of forced ventilation and therefore natural air changes would not play a part in this problem. By natural air changes is meant air changes as the result of air entrance through cracks, etc. As such a mill would be tight against this type infiltration or exfiltration, forced ventilation would be a necessity.

We have never figured that the introduction of humidity in an area would change the natural infiltration or exfiltration rate. The rise in vapor pressure is a very slight thing compared to the total barometric pressure. Furthermore, there is always a tendency for the barometric pressure to equalize continually.

Theoretically, if a slight pressure increase takes place inside as the vapor expands, then one would naturally expect a flow outwards. However, the increase in pressure is so very slight that we have never considered it in our calculations.

Chief Engineer,
Providence, R. I. — *Humidifying Co.*

Problem to be Discussed

In a line carrying a process fluid, it is important that a check valve be placed to prevent a reversal of flow when the back pressure increases. Someone raised the question that in a pipe line of low fluid flow, better protection at lower cost would be provided by a lift type of check valve as against the swing type. If so, why? If not, when would the use of a lift type check valve be recommended?

NEWS OF EQUIPMENT AND MATERIALS

Use the prepaid postcard opposite Page 102 for securing additional information on items described in this department.

Cartridge Powers Stud Driver

Three grains of propellent powder generates enough controlled energy to drive a steel stud into a structural steel plate three-quarters of an inch thick, using the Model 450 stud driver developed by Remington Arms Company, Inc., Bridgeport, Conn. Weighing a little more than five pounds, the cartridge-powered tool can be easily operated by one man and its high degree of portability and efficiency is of interest to plumbing, heating, general, and other contractors.

The maker claims the use of this tool can represent a saving in labor costs as high as 75% over other methods employed. The energy is supplied by a 32 caliber Long rim fire blank cartridge. A colored plastic heel cap or cup is inserted in the mouth of the cartridge case. The color indicates the powder load, varying in accordance with the job intended. The studs used vary in length from ⅝ to 2¾ inches long and are made of specially developed steel alloy. The tool operates completely independent of outside power sources.

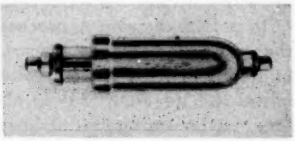
A number of accessory fixtures for the tool are available for jobs, such as attaching electrical conduit to concrete and steel, attaching corrugated steel and asbestos roofing and siding to steel frame buildings, etc. Each accessory incorporates a safety shield, similar to that on the standard model and without which the tool cannot operate.

For more information, circle on Inquiry Card, **Item 1**

Refrigeration Indicator-Drier

The Cee-Kleer liquid indicator and combination liquid sight gage driers are announced by Cee Kleer Products Co., Cincinnati, Ohio.

The magnification of the stud in the center of the indicator, when the liquid is in the glass, is easily seen at any distance with a full 360-degree visibility. Cee-Kleer liquid indicators and combination liquid sight driers will show excess in oil in the system at once.



Combination sight driers are made in 12, 20 and 30 cubic inch capacities, in ¼ and ⅜ inch S.A.E. sizes. Liquid sight gage indicators are made in ¼ and ⅜ inch S.A.E. male-to-male and female, ½ inch S.A.E. male-to-male and ½ inch sweat fitting sizes.

For more information, circle on Inquiry Card, **Item 2**

Gas Pilot-Safety Shut-Off Valve

The MR-5 gas cock safety valve, a safety control for gas appliances, has been placed on the market by General Controls Co., Glendale, Calif.

In furnaces, the trend is toward compact units. As the size of the furnace diminishes, its automatic control valves also must lessen in size. The new unit, meeting this situation, is the smallest combination safety and plug valve available. It thus provides a distinct advantage in the making up of manifold structures.

Other than size, the most important feature is the fail-safe operation. Being a pilot safety valve, the device has a particular advantage in that it fails to the safe side in the event of pilot flame failure. The unit is mainly a safety shut-off valve, consisting of a thermocouple safety incorporated into a high flow gas cock valve structure.

Uses of the valve include unit heaters, boilers, wall furnaces, water heaters, circulating heaters, gas floor furnaces and forced air "blowers." In each of these the valve serves as the manual shut-off valve, as well as the safety shut-off in event of pilot failure. It is available in pipe sizes ranging from ⅜ to ¾ inch.

For more information, circle on Inquiry Card, **Item 3**

Heavy Duty Humidifier

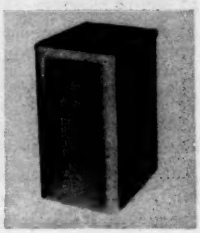
Development of a new model heavy-duty high capacity humidifier is announced Daffin Mfg. Co., Lancaster, Pa. The unit, Hum-O-Zone model 300-B, uses a high pressure pump which breaks up water through nozzles. The unit dispenses high degree of humidification over a large area and the unit occupies little space, measuring 22 by 26 inches wide by 42 inches high. The unit discharges approximately 1,200 cubic feet of air per min.

The device is a complete packaged unit which operates independent of a heating system and requires only a cold water supply and a 110-volt ac in most installations. No water drain is necessary because the tank capacity is controlled by a float.

For more information, circle on Inquiry Card, **Item 4**

60 Lb Portable Dehumidifier

A completely portable, ⅛ hp Humidry unit, designed for a wide range of dehumidification jobs from home basements to vaults and storage lofts, is announced by Carrier Corp., Syracuse, N. Y. The improved model, weighing 60 pounds, has been fitted with casters and handholds so that it can be easily moved wherever needed. The unit can be plugged into any standard 115-volt circuit.



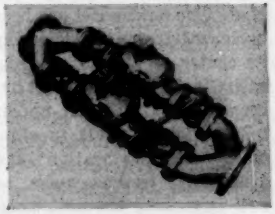
Under conditions of 80 deg and 70% relative humidity, the unit is capable of removing 18 pints of water from the air in an average space every 24 hours. Reason for its high capacity lies in the special vertical arrangement of spiral finned evaporator coils. The constant downward drainage of water along the spiral fins maintains a damp clean coil surface, and at the same time prevents an accumulation of water on the coil, thus insuring the most effective heat transfer conditions.

Unit is enclosed in a flat-topped, rectangular cabinet, measuring 23½ inches high, 17½ inches long, and 13½ inches wide, with a baked hammertone enamel finish. Condensed moisture can be disposed of through the nearest drain by attaching a piece of rubber tubing to the drip pan spout. A removable condensate pail is also provided with the unit.

For more information, circle on Inquiry Card, **Item 5**

Compound Water Meter

Where large water users, such as laundries, process industries and apartment buildings, have the problem of proper meter maintenance without costly shutdowns or extra-hour work, a new compound meter manifold unit introduced by the Rockwell Mfg. Co., Pittsburgh, Pa., provides the answer. The manifold assembly consists of two Pittsburgh-Empire single register compound meters in combination with four Nordstrom lubricated plug valves and two 8 in. reducing manifolds, so arranged that for maintenance, one side at a time may be shut down without complete interruption of service.



By isolating one side, a meter can be removed and exchanged for one serviced and calibrated in the shop, while flow continues through the other meter passage. It is also possible, with this assembly, to check-test a meter in place without a break in service. To make such a test, the discharge valve of the meter may be shut off and the test plug in the meter body used for the test run.

The manifold assembly has the same flow capacity—1,600 gpm—as the American Water Works Association requirement for an 8 in. compound meter. Sold as a unit, it is priced below a single 8 in. compound meter, and the complete manifold of meters, valves and piping weighs 100 lb less than a comparable 8 in. compound meter.

For more information, circle on Inquiry Card, **Item 6**

New Production Soldering Process

A revolutionary new soldering process for use in the manufacture of unit heaters, automotive radiators, and other heat exchange equipment has been developed by McCord Corp., Detroit, Mich., in cooperation with Mathieson Chemical Corp., Baltimore, Md. Called the Coronil soldering process, the chemical-metallurgical method employs a new series of soldering fluxes bearing the trade name M.C.C. These fluxes are suitable for use in joining most of the commonly used metals and produce solder bonds of highest strength, leave no corrosive residues and eliminate corrosion of plant equipment.

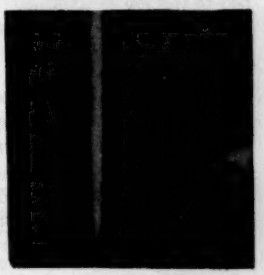
The new process eliminates the substantial corrosion losses previously encountered, simplifies production methods and produces joints of superior strength which are less likely to be troubled with corrosion in the field.

The fluxes are made from hydrazine, first used on a large scale as a rocket fuel. Early research by McCord determined that certain hydrazine compounds answered the requirements of an ideal soldering flux, and a cooperative laboratory and plant experimental program with Mathieson resulted in the development.

For more information, circle on Inquiry Card, **Item 7**

Filter Gage for Furnaces

A visible air filter gage for automatic forced air heating units, enabling the owner to tell at a glance the condition of the filters, has been introduced by The Heil Co., Milwaukee, Wis.



The Tell Tale gage is mounted on a side panel of the furnace, with a flexible plastic tube leading from it through the filter and into the blower compartment. When new filters are installed, a green marking arrow is set at the position of the float in the tube. As the filters become clogged the float rises in the tube. When it reaches the red arrow it is time to change filters. It is simple and foolproof.

The new gage is standard equipment on many models of Heil winter air conditioning furnaces and can be quickly and easily installed in older furnaces not already so equipped.

For more information, circle on Inquiry Card, **Item 8**

Adhesive-Backed Felt

A reinforced felt tape with a pressure-sensitive adhesive back is announced by Products Research Co., Glendale, Calif. Known as Kling Felt, it does not require a paper or other separation material between layers and, as a consequence, can be applied very rapidly.

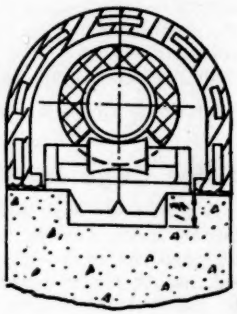
Uses for this felt include rattle and squeak deadening; sealing against dust, wind, fumes and foreign materials; as a thermal insulator; for vibration and shock cushioning in fragile crating and on machinery; for scratch protection and many other protective applications.

The felt is available in rolls from ¼ to 66 inches wide and in thicknesses of 1/64, 1/32, 1/16, ⅛, and ¼ inch. Kling Felt is also available as a cut gasket, die-cut to specifications.

For more information, circle on Inquiry Card, **Item 9**

One-Pipe Underground Conduit

The U-Tile type conduit is announced by Porter-Hayden Companies, Newark, N. J. For general underground pipe work these companies usually recommend their larger Therm-O-Tile conduit, but where there is need for a conduit for one-pipe installations, or for installations having several small pipes, the new conduit has been developed.



These U-Tiles are shipped to the job as flattened cylinders, scored longitudinally on both of the flattened sides. Tapping over each scoring with a hammer splits the cylinders into two U tiles, one of the halves being shown in section in the sketch, the U being up-side-down. A circumferential scoring at one end of each tile when chipped off provides a rough-edged bevel which permits the jointing mortar to key and bond into the channels formed within the tile sections. This makes possible strong, tight, flush joints, which can be effectively sealed with asphalt waterproofing mastic.

For more information, circle on Inquiry Card, **Item 10**

Encased Precipitron Units

An encased Precipitron electronic air cleaner is now available from Westinghouse Electric Corp., Sturtevant Div., Boston, Mass., in a form that resembles a factory-fabricated section of air duct or plenum chamber 96 inches long with a built-in Precipitron. The complete air cleaning package, the Type PE encased Precipitron, assures minimum installation time and expense with maximum air cleaning efficiency.

The PE units are available in air cleaning capacities ranging from 8,330 cfm at 90% efficiency to 44,000 cfm at 85% efficiency. Booklet DB 93-820 is available.

For more information, circle on Inquiry Card, **Item 11**

Regulator for Oil-Fired Boilers

A steam pressure regulator for oil-fired burners is being marketed by Superior Controls Co., Inc., Los Angeles, Calif., as the Type L-25R. This valve is normally in a closed position and opens with steam pressure. Upon reaching the predetermined pressure setting, the valve will open and remain open until the steam pressure drops slightly below the setting point, by-passing the fuel from the burner to the storage tank.

This valve is designed to operate on either a gravity or pressurized fuel system. The needle valve action makes possible a modulated flow so that the delivery of the fuel is increased or decreased as the steam pressure varies, thus guaranteeing a constant pressure.

The needle valve is precision machined of high quality brass or stainless steel, has a standard ⅛-inch orifice, ½-inch inlet size and ¼-inch outlet. Regulator comes adjusted to the customer's specified steam pressure but is easily readjusted to any pressure desired.

For more information, circle on Inquiry Card, **Item 12**

1/5 Hp Portable Dehumidifier

A new model Aqua-Sorber portable dehumidifier has been introduced by Aqua-Sorb Corp., East Orange, N. J. The new model has been decreased in height, lowering its center of gravity, and the entire inside of the cabinet has been treated with an undercoating which tends to eliminate metal vibration and drumming, lessens noise as well as making the unit moisture-proof.

A new type of container having a 12-quart capacity and more easily handled is now being used. A drain fitting, which will take any threaded hose coupling, is provided for permanent draining.

The top is a four-way air diffuser and basic equipment includes circular coils, a 1/5 hp hermetically sealed compressor using Freon-12. The cabinet measures 13 x 13 x 29½ inches.

For more information, circle on Inquiry Card, **Item 13**

Combination Gas-Oil Burner

The Model GW combination gas and oil burner is a recent development of Petroleum Heat and Power Co., Stamford, Conn. It offers engineering advantages to users of natural or mixed gas for commercial or industrial purposes. It is intended for commercial heating applications where it is desired that an alternate fuel be readily available for quick use so that a change from one fuel to the other be done without loss of time or steam pressure, and at no cost.

Taking these factors into consideration, the maker, in this unit, has incorporated the following features: 60-second changeover from one fuel to the other; maximum combustion efficiency from either fuel; combustion of either fuel entirely independent of the other, and no shutdown periods and no costly adjustments for changeover.

The burners are designed for use with cold No. 5 fuel oil or lighter, and with 1,000 Btu per cu ft natural gas or 800 Btu per cu ft mixed gas. They are currently available in a range of five sizes to furnish from 3,750,000 to 15,000,000 Btu per hour. Further sizes are being developed. Bulletin 150-C is available.

For more information, circle on Inquiry Card, **Item 14**

Oil Burner Cut-Off Device

Completion of tests of a low-cost, easily installed cut-off mechanism which aids fuel oil conservation by improving the efficiency and economy of oil-fired heating systems is announced by Socony-Vacuum Oil Co., Inc., New York, N. Y. The principal functions of the mechanism are to provide maintenance of balanced combustion conditions at all times in a heating unit and to minimize the presence of partly burned fuel and deleterious deposits in connection with many varieties of gun-type burners.

The basic parts for an attachment to a heating unit are available as stock items in manufacturers' lines for as low as $15. Socony-Vacuum's contribution to the development was the experimental proof of its worth in improving burner efficiency. It can operate over a long period with a minimum of attention.

Some of the results include cleaner burner operation and cleaner chimneys, reduced need for cleaning of boilers and furnaces due to deposits of soot, and improved efficiency of the heating unit and consequent reductions in the amounts of fuel consumed.

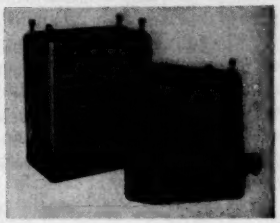
The mechanism functions by preventing the flow of oil from the fuel pump to the oil burner nozzle until the pressure of the oil and the rotating speed of the fan reach their full operating level. Then the oil is sprayed into the combustion chamber in a completely atomized form and starting smoke is eliminated.

The mechanism acts to eliminate smoke when the furnace ceases operation by instantaneously cutting off the supply of oil to the nozzle. Thus no oil is permitted to enter the combustion chamber after the fan has stopped.

For more information, circle on Inquiry Card, **Item 15**

New Line of Gas Unit Heaters

A new line of gas-fired unit heaters, including fan, blower and duct-type models, with sheet steel and cast iron heat exchangers, is announced by United States Air Conditioning Corp., Minneapolis, Minn.



Designed for use with natural, manufactured, mixed or propane gas, the heaters are housed in heavy gage steel cabinets with blue-green enamel finish. Four point suspension permits rigid mounting without strain on gas lines or piping. Adaptor kits are available when two point suspension is specified. The units can be mounted within six inches of the ceiling. A hinged lower panel gives easy access to internal parts.

Series 23 unit heaters with sheet steel heat exchangers are available in the fan type in sizes ranging in capacity from 55,000 to 200,000 Btu per hour and are also offered in blower-type models, with adjustable motor pulleys to permit changing the lower speed.

Series 20 heaters, equipped with cast iron heat exchangers, in capacities of 100,000 and 135,000 Btu per hour, are available in standard propeller fan, blower and duct types.

For more information, circle on Inquiry Card, **Item 16**

Control Valve Has Babbitt Seat

Heavy-duty water valve 788, announced by R-S Products Corp., Philadelphia, Pa., is equipped with totally enclosed gear reduction drive, extended shaft and floor stand. The sealing of water pressure is obtained by utilizing a babbitted seat in the body and Monel or stainless steel welded to the periphery of the valve disc.

Such metal-to-metal seat gives satisfactory commercial shut-off in most installations. For instance, with a 350-foot head of ambient water, a 36-inch valve with a babbitted seat has a leakage of only 50 gph. Remote, automatic or semi-automatic controls are also available for this type of valve.

For more information, circle on Inquiry Card, **Item 17**

Four New Cooling Towers

Four improved models of cooling towers, for use with self-contained air conditioning units and other water-cooled refrigeration applications in the 5 to 15 hp capacity range, are announced by Carrier Corp., Syracuse, N. Y. The new models feature a built-in, two-bend, eliminator blade section which virtually eliminates overspray, thus reducing water consumption to a minimum.

These models are an improved version of a radically new line of cooling towers introduced last year using a water turbine drive for the fan and spray system, for economy and simplicity of operation. This type of drive eliminates the need for electrical connections to the unit. Turbine bearings are supported on a film of water with no metal-to-metal contact, insuring long operating life and requiring no lubrication.

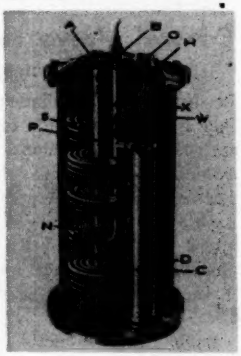
An exclusive fill material of asphalt impregnated board, which is extremely light in weight, non-warping, and impervious to water, prevents the water-logging and resultant increase in weight typical of conventional wood fill material.

The four models are designed for 5, 7½, 10, and 15 hp air conditioning systems.

For more information, circle on Inquiry Card, **Item 18**

Constant Temperature Hot Water

A new design heat exchanger for heating water by steam is being marketed by Aerco Corp., Englewood, N. J. The feature of this hot water generator is its ability to maintain a constant outlet temperature by means of a temperature regulator bulb located in the water space inside the heater but not directly in the path of hot water discharge, as opposed to locating it outside the heater as is done conventionally.



The shell is filled with water *W* heated by steam coils *S* supplied from the steam supply *C*, condensate returning through *D*. Steam supply is regulated by a regulator controlled by the thermostat *B*. When hot water is drawn off through outlet *O*, cold water enters the heater through *A* and flows downward through the cold water feed pipe *P*. A portion of this flow is by-passed through the compensator assembly *X* into the thermostat tube *H*, into which hot water is flowing at *H* and also through the holes below. Changes in the temperature of this mixture of hot and cold water act on the thermostat tube and thus cause the regulator to modulate the steam flow to maintain a constant outlet temperature. The circulation induced in the thermostat tube is due to the nozzle *N*.

As a result, an increase in the cold water flow, due to demand for hot water, causes more cold water to by-pass to the thermostat tube, so that the lowered temperature reacts on the thermostat and regulator to supply more steam. A decrease in the cold water flow thus causes the opposite reaction. Similarly, a change in the temperature of the incoming water reacts either further to open or close the steam regulator to meet the changed condition. A shut-down of water flow causes the by-pass flow to cease, the temperature in the thermostat tube to rise rapidly, and the steam regulator to close.

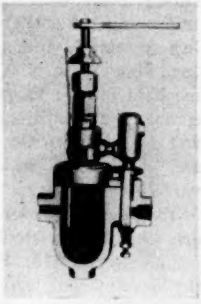
The steam coils are free floating so that sudden or extreme changes of temperature cannot rupture the tube connections, there being ample room for expansion or contraction, and the coiled units are easily accessible.

The heaters are made in a wide variety of sizes and heating surfaces with capacities ranging from 4 to 240 gallons per minute through a 100 degree temperature rise with 5 lb steam, and 7.3 to 438 gallons per minute with 100 lb steam, capacities at pressures between being in proportion.

For more information, circle on Inquiry Card, **Item 19**

Continuous Blowdown Valve

A new K-Master valve, which provides a safe, efficient means for maintaining correct boiler water concentration by continuous boiler blowdown, has been introduced by Kaye & MacDonald, Inc., West Orange, N. J. By eliminating hit or miss intermittent manual boiler blowdown, the new valve prevents severe flashing conditions of hot, dirty blowdown, loaded with trouble-making impurities which cause plugged valve ports, valve and seat erosion, plugged pipe lines, and other expensive maintenance problems.



The boiler blowdown assembly can be quickly dismantled for servicing the valve, valve seat, restricted orifice, and strainer without breaking a pipe joint by simply removing two nuts. Flow rate can be adjusted accurately through a wide range. Wiredrawing effect of high velocities is eliminated.

Bodies for 250 psi valves are semi-steel with stainless steel trim, standard tapped for ½ or ¾ inch pipe. For higher pressures, bodies are all steel with stainless steel trim.

For more information, circle on Inquiry Card, **Item 20**

Low Cost Comfort Cooler

In answer to the increasing demand for low cost comfort cooling and air conditioning, the Kramer Trenton Co., Trenton, N. J., announces a ceiling type comfort cooler with an unusually low installed cost per ton of refrigeration. The cooler is the only unit of its type using a filter, the maker states. The filter, of standard size, is of the throw-away type.

The cooler is mounted in the conditioned area, while the compressor can be installed in the cellar or any other remote location. Since the unit is ceiling mounted, it requires no floor or wall space. It requires no ducting and can be located to cover specific areas. By the use of more than one unit, it is possible to cover areas that are L-shaped and other unusually shaped areas, without the use of costly ducting. Adjustable louvers cover the complete discharge of the unit and direct the air stream.

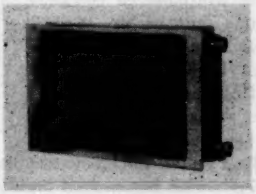
The noise level is at a minimum, low-speed motors, rubber-mounted, and quiet fans are used. Since the compressor is in a remote position, compressor noises are completely eliminated.

The cooler has a nominal capacity of 2.6 tons and can be used to a 2 or 3 hp compressor.

For more information, circle on Inquiry Card, **Item 21**

Steam Heating Coils

A new line of steam heating coils for use in combination with air conditioning coils, or as tempering and booster units in long heating ducts, is announced by Rempe Co., Chicago, Ill. The coils are available in both single and double row design. The single row are for booster and tempering service and the double row for heavy duty or mixed air heating service. Capacities range from 60,000 to 775,000 Btu per hour.



The units are constructed with heavy gage steel casings, copper tubes and headers, 7 aluminum fins per inch. All fins are collared to tubes. Coils are tested 350 lb air pressure for steam working pressures up to 125 lb.

For more information, circle on Inquiry Card, **Item 22**

Refractory Insulation

Hylag, a multi-use refractory insulation for temperatures ranging from 150 degrees to 2,200 degrees F, is in quantity production, Continental Coatings Corp., of New York, N. Y., and South River, N. J., announces. It is intended for tanks, furnaces and boilers, heat exchangers and steam generators, and is currently being used in powerhouses, oil and sugar refineries, steel mills, stripping plants, and in the marine field.

For more information, circle on Inquiry Card, **Item 23**

Synchronous Motor Timer

A synchronous motor timer, the type SY Promatic, for accurate control of a wide variety of timed operations, has been developed by General Control Co., Boston, Mass. This timer can be used for all time periods between ½ second and 24 hours. It actuates five load contacts independent of the timer-control circuits. There are two separate solenoids, one operating the clutch and timing mechanism, the other the load contacts. The timer automatically resets for each new cycle.

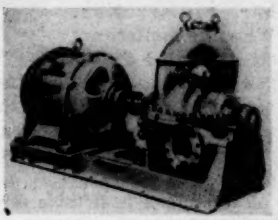
Sturdily mounted in a cast frame, long life is assured through an O-ring-drive assembly which eliminates gears. The preset interval and the elapsed time are both clearly visible on the 3⅜ inch diameter dial.

The timer is available for either 115 or 230 volts ac.

For more information, circle on Inquiry Card, **Item 24**

High-Head 2-Stage Pump

A completely redesigned line of two-stage pumps, designated as Type DMD, is announced by Economy Pumps, Inc., division of Hamilton-Thomas Corp., Hamilton, Ohio.



In the redesigning process, the pumps have been improved with regard to compactness, pumping efficiency and mechanical ruggedness. These pumps are made in sizes from 2 to 10 inch discharge and capacities up to 4,000 gpm and heads to 750 feet.

The two-stage design is said to be most effective in that a single pump, driven by a single motor, produces as much head as two single-stage pumps piped in series. The new models are recommended for services such as building water supply, hydraulic elevators, oil refineries, mines, chemical plants, boiler feeding and other allied uses.

Broadly stated, the pump is an economical unit for rugged service, incorporating many mechanical features to assure long and reliable service. Features include a horizontally split casing with interconnecting passage between the two opposed impellers. The impellers are the non-overloading type, hydraulically and dynamically balanced at the factory.

For more information, circle on Inquiry Card, **Item 25**

Filter Deodorizing Treatment

A deodorizing treatment for air filters has been introduced by Research Products Corp., Madison, Wis. Filter, when treated, not only removes dust from the air but also removes the odors by means of the liquid solution which is impregnated in the fibers of the throw-away type filter or sprayed onto the aluminum permanent filter, as shown at the right of the accompanying illustration.

A recent trial of the treatment was made in a packing plant, while another test was conducted by using the heads of dead fish, cheese, and other strong smelling materials, the odor from which did not pass through the impregnated filter.

The chemical is available from the manufacturer and one treatment is said to last in a throw-away type filter as long as the filter will effectively catch dust. A few ounces is sufficient to treat one filter.

For more information, circle on Inquiry Card, **Item 26**

Register for Perimeter Heat

The Fig. DRP DuraBilt floor register, especially adapted to perimeter heating, has been introduced by The Auer Register Co., Cleveland, Ohio.

These registers have DuraBilt cross-locked bar construction. When the shutters are set as desired for air flow control, there is a locking device to maintain this balance adjustment. When this adjustment is set and so secured, the shutters can still be entirely closed when desired, and also returned to the adjusted open position.

The register is suitable for use in any type of floor with perimeter heating, and is available in six sizes ranging from 4 x 10 inches to 6 x 14 inches.

For more information, circle on Inquiry Card, **Item 27**

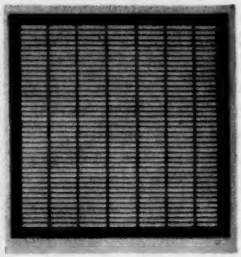
Improved Line of Registers

Introduction of its 1951 line of registers is announced by Krauser-Boyd, Inc., North Tonawanda, N. Y. An improved closure and sturdier hanging mark advances over the previous line. As in past years, the registers come in heavy gage enameled steel, with a grille that provides directional airflow and conceals the interior. The improved closure permits convenient control of heat volume and a tight seal of the duct opening when the register is not in use.

For more information, circle on Inquiry Card, **Item 28**

Heavy Duty Industrial Grille

A heavy duty industrial air conditioning grille has been announced by Titus Mfg. Corp., Waterloo, Iowa. The volume control portion features the solid-section Airfoil louvers, streamlined to keep noise and turbulence to a minimum. Each blade is individually adjustable. In addition, the concealed louver support eliminates mullions and butted construction.



Grille face has 14-gage steel blades set on ⅜ inch centers, while 14-gage vertical steel support bars are placed on 6 inch centers to give added strength.

Although grilles come with a standard grade primer coat finish, they can be custom finished, as desired.

For more information, circle on Inquiry Card, **Item 29**

Non-Scarce Radiant Heat Coil

Therma-Koil, a newly developed non-corrosive coated flexible steel tubing, has been introduced by Thermapanels, Inc., San Jose, Calif. It is a low-cost product designed specifically for radiant heating installations.

The flexibility of the tubing is illustrated by the fact that it can be bent by hand to a 3 inch radius. Its light weight cuts installation costs. It is available in continuous lengths up to 500 ft., and special work-saving compression fittings are available.

This product, which has been tested in the field and in the laboratory, has a double protective coating which has proved highly resistant to corrosion under critical conditions both before and after installation. It replaces war-scarce materials for all types of buildings and has been accepted for home use by FHA.

The coils are formed of continuous strip SAE 1008 steel with .035 inch wall, rolled and joined by resistance welding giving a uniform weld which equals the strength of the entire tube. It is tested to 1,000 lb pressure and checked for accuracy of diameter. The exterior of the tubing is protected against corrosion by Bonderizing and by a baked, chlorinated, rubber base coating resistant to acids, alkalies, salt-spray, alcohols, gasoline, aliphatic hydro-carbons, and mineral oils.

The coil is immediately available in ⅜ inch and ½ inch inside diameter.

For more information, circle on Inquiry Card, **Item 30**

PRODUCT INFORMATION SERVICE

Use the postage-free postcard below for further information on:

- **News of Equipment and Materials**
- **New Catalogs**

Circle the Item Numbers in which you are interested and print clearly your name and address with title.

NEW CATALOGS

HIGH TEMPERATURE INSULATION

A four-page folder, IN-134A, on Superex block high temperature insulation has been released by Johns-Manville, New York, N. Y. It covers economic advantages and outstanding properties of this insulation, with this information on conductivity and heat loss graphs, as well as a recommended thickness table. .....Item 31

COOLING TOWERS

Publication of a new bulletin, No. 18PT, is announced by Baltimore Aircoil Co., Inc., Baltimore, Md., describing its line of PT cooling towers in detail. This publication includes specifications, dimensions and illustrations of vertical propeller type cooling towers ranging in size from three tons to 100 tons. Of special interest is the cooling tower selection chart which provides a quick and simple method of selecting the proper size tower for various operating conditions. This chart also applies to the UT line of cooling towers. .....Item 32

DRAFT CONTROL SYSTEMS

Three new bulletins on automatic controls and instruments for Perfex draft control systems are ready for distribution, according to Industrial Controls Dept., Perfex Corp., Milwaukee, Wis. One bulletin deals with oil, a second with gas, and a third with stoker-firing. In each bulletin it is pointed out that the draft control system handles three important control functions: (1) Controls draft in the firebox during "off" periods to prevent excessive stack losses; (2) opens damper before restarting burner to provide safe starting conditions; and (3) switches to automatic draft control during burner operation to maintain constant draft in the firebox. Application of each control is shown by a pictorial layout with functions of each control outlined. Each bulletin is complete with typical wiring diagrams suggesting how the systems can be easily incorporated into the burner control system. Wiring diagrams also show relationship of other automatic Perfex controls such as pressure and temperature controls, stoker timers and gas valves. .....Item 33

HEAT RECLAIMED BY UNIT HEATERS

Utilization of unit heaters for recovery and distribution of waste heat from engine and compressor jacket water is covered in a new bulletin 00531A issued by Modine Mfg. Co., Racine, Wis. Method of using waste heat to lower plant space heating costs is fully explained. Several actual installations are detailed to illustrate piping hook-ups and control methods. Bulletin also shows how to select the correct size and type of unit heaters and gives a typical example illustrating calculations. Basic hot water capacities of unit heaters are included in performance tables. .....Item 34

DO'S AND DON'TS IN HEATING

Vital do's and don'ts in the selection and application of radiation heating equipment for steam or hot water systems are contained in a 32-page manual, No. 1295, by C. A. Dunham Co., Chicago, Ill. For architects, consulting engineers, jobbers and heating contractors, this manual is a guide for specifying, selling and installing convector, baseboard, and Fin-Vector radiation. A step-by-step procedure for selecting radiation is graphically illustrated with sample capacity tables. Drawings show most efficient methods for installing equipment in both wood frame and masonry construction. Diagrammatic sketches plus engineering data show how to rough-in piping for a typical baseboard installation. .....Item 35

BULLETIN ON SNOW MELTING

A study of 50 snow melting systems operating in 15 different businesses and industries in 17 states has just been published in a 36-page bulletin by A. M. Byers Co., Pittsburgh, Pa. The bulletin, titled Byers Wrought Iron for Snow Melting Systems, traces the growth of the systems from the first recorded installation in the United States in 1925 through hundreds of installations of the past six years. Booklet contains 83 illustrations, mostly showing the systems either operating or being installed, plus eight piping layouts for a variety of installations, including loading areas, ramps, sidewalks, driveways, and highways. Text contains chapters devoted to: design, piping properties, use of anti-freeze, paving design and fill, fabrication and installation, installing and operating costs, operating practices, controls, and auxiliary units. .....Item 36

UNIT AIR CONDITIONER

A colorful, profusely illustrated, 12-page booklet, B-5158, that describes the benefits of air conditioning in almost any type of installation, such as beauty parlors, lunch rooms, and factories, is available from Westinghouse Sturtevant Div., Hyde Park, Boston, Mass. Keynote of the booklet is "An investment you can't afford to be without." From there it points up, one after the other, the benefits of air conditioning: customer comfort that means repeat sales; improved working conditions that means happier and more attentive employes; and, cleaner air that means fewer mark-downs and lower redecorating costs. .....Item 37

NOZZLES, WELDING NECKS, FLANGES

Catalog 501, which describes and illustrates the company's nozzles, welding necks and large diameter flanges, has been issued by Taylor Forge & Pipe Works, Chicago, Ill. Also included with this 72-page elaborately prepared catalog are standards of the Tubular Equipment Manufacturers Association. Also included in the same binding is Bulletin 502, 44 pages, entitled "Modern Flange Design" and including engineering data on this subject, together with pages arranged for making detailed calculations on flanged design. .....Item 38

VENTILATING FANS

Form 513C, 4 pages, standard size, has been published by Schwitzer-Cummins Co., Indianapolis, Ind., on its line of ventilating products, including attic fans, window fans, cabinet fans, exhaust fans and blowers, each of which is described, illustrated and accompanied by capacity and dimensional information. .....Item 39

Postage Will be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 66, SEC. 34.9, P. L. & R., NEW YORK, N. Y.

HEATING AND VENTILATING

148 LAFAYETTE STREET

NEW YORK 13, N. Y.

READERS' SERVICE DEPT.

SQUIRREL-CAGE MOTORS

Bulletin MU-132, published by Wagner Electric Corp., St. Louis, Mo., describes the company's type EP and JP polyphase squirrel-cage motors. Descriptions, illustrations and dimensional data are included. .....Item 40

MOTORS

Bulletin MU-94 has been issued by Wagner Electric Corp., St. Louis, Mo., and featuring in four pages its single and polyphase motors. .....Item 41

ROOF COOLING SYSTEMS

A 4-page bulletin, No. 20, has been brought out by Water Cooling Corp., New York, N. Y., and covering its roof cooling systems. Roof cooling systems are defined, advantages explained and equipment described in detail, together with typical specifications. .....Item 42

UNDERGROUND PIPE CONDUIT

An 8-page booklet, No. 511, describing Therm-O-Tile underground pipe conduit, has been published by H. W. Porter & Co., Inc., Reid Hayden, Inc., Newark, N. J. Full descriptive material, together with specification data are included. .....Item 43

INDUSTRIAL INCINERATORS

A 9-page standard-size bulletin describing its line of commercial and industrial incinerators has been issued by Goder Incinerator Corp., Chicago, Ill., maker of Brule incinerators. These incinerators range from those with the hottest fires, such as sawdust burning, testing the structure of the unit, to those presenting the coldest charge, such as the burning of celery trimmings, which demands peak combustion efficiency. .....Item 44

REFRACTORIES AND INSULATION

A 40-page catalog on its refractories and insulating materials has been published by Refractory and Insulation Corp., New York, N. Y. The line, comprehensively described together with application data, includes castable cements, bonding cements, ramming type refractories, block and blanket insulation, plastic heat insulations, fill insulations, and surface protective coatings. .....Item 45

DUST PRECIPITATOR

Bulletin 1728, 12 pages, has been issued by American Blower Corp., Detroit, Mich., devoted to its Series 342 precipitator for fly ash, cinders and industrial dusts. Bulletin thoroughly describes the units in addition to giving comprehensive tables and curves on performance and selection. .....Item 46

SAFETY HEADS

Safety heads for relieving pressure in various types of vessels, including convertors, pipe lines and compressors, are the subject of a comprehensive 52-page catalog, No. 54, published by Black, Sivalls & Bryson, Inc., Kansas City, Mo. Bulletin includes charts and tables covering all phases of safety head information. .....Item 47

OIL-BURNING EQUIPMENT

The story of its progress in oil-fired heating equipment is featured in a booklet issued by Electrol Burner Mfg. Co., Rutherford, N. J., under the title Electrol —Finest in Oil-Fired Equipment, Since 1918. This eight-page booklet describes the company's burners, water heaters, warm air conditioners, and boilers, tell how they meet every heating requirement; and gives specifications and dimensions for installing each unit. .....Item 48

STANDARDS FOR MULTIPLE V-BELTS

The Rubber Manufacturers Association, Inc., New York, N. Y., and the Multiple V-Belt Drive & Mechanical Power Transmission Association, Chicago, Ill., have announced completion and issuance of a 16-page manual of recommended Engineering Standards for Multiple V-Belt Drives, as developed and approved by the technical committees of both associations. The standards may be obtained at a cost of $1 for two copies from either of the associations. Item 49

HIGH PRESSURE AIR DIFFUSER

The new Kno-Draft type HPC II high pressure air diffuser is described in Bulletin K-26, published by W. B. Connor Engineering Corp., Danbury, Conn. Performance data, drawings and installation views are shown. This diffuser handles air at high pressures and high velocities, permitting the use of unusually small, exposed ducts of uniform size. A smaller volume of air at low temperature provides the cooling effect ordinarily requiring a greater amount of air at a higher temperature. .....Item 50

DRAFT AND LOW PRESSURE INSTRUMENTS

A new functionally designed fully indexed bulletin, 51-667, on its line of draft and low pressure instruments is available from The Hays Corp., Michigan City, Ind. It discusses indicators of seven types, recorders, and controllers. A two-page application table is included to aid the reader in selecting the correct instrument for his conditions. Features such as calibrating springs, diaphragm units, and differential valve assemblies are explained. Size, scales, ranges, cases, etc., of each instrument are illustrated and discussed. In addition, 14 types of draft and pressure, differential and other measuring elements are pictured. .....Item 51

FILTERS FOR CONDITIONERS

A revised catalog of air filter sizes for air conditioning units has been announced by Owens-Corning Fiberglas Corp., Toledo, Ohio. The 16-page booklet, D51-5, is available by the company through manufacturers of air conditioning equipment to their distributor and dealer organizations to expedite and simplify ordering of air filters. Included are sizes and number of filters required for air conditioning units manufactured by 31 companies. Equipment is listed under manufacturer's identification numbers to facilitate ordering of filters. ..... Item 52

OIL HEATER CATALOG

An enlarged catalog, Bulletin O-51, has been issued by Water Tube Boiler and Tank Co., Inc., Chicago, Ill. Three new products are included: the Gas-Tu-Bo oil preheater which heats oil indirectly by gas and operates independently of the boiler; the Wa-Tu-Bo safety oil heater which is so constructed that oil cannot enter the boiler water if an oil heating tube fails, and the Type-U tube oil heater, recommended where a low cost installation is specified.....Item 53

SPRAY NOZZLES

Bulletin N-617, 20 pages, issued by Yarnall-Waring Co., Philadelphia, Pa., on spray nozzles replaces the 16-page 1949 edition N-616. Details covering Yarway involute nozzles for spray cooling ponds are given and corresponding information on smaller involute and flat-spray nozzles for industrial processes are included elsewhere. ..... Item 54

COOLING TOWERS

A new bulletin, No. 401-A, on its line of cooling towers from three to eleven tons, has been released by Acme Industries, Inc., Jackson, Mich. In two colors, the bulletin describes compact, induced draft cooling towers and describes details concerning the housing, fan, filling eliminator and other component parts of the units. Nominal capacities and general dimensions are also included. Ratings are given at 78F wet bulb for both seven and half degree and ten degree water range. A table giving a suggested maximum number of units per tower is included.....Item 55

DATA FOR HEAT TRANSFER PROBLEMS

New laboratory data on the use of Platecoils as a medium of heat exchange is available in a technical manual published by Platecoil Division, Kold-Hold Mfg. Co., Lansing, Mich. These technical data are based, in part, on the results of an extensive research program conducted by Battelle Memorial Institute involving all styles and representative sizes. The manual thus provides the engineer with the principal data required in the solution of heat transfer problems. It simplifies the process of selecting and applying industrial heat transfer equipment by supplying charts and formulas to aid in the basic calculations of industrial heating and cooling applications. ..... Item 56

PLEASE SEND US MORE INFORMATION. Circle below item numbers on which you wish further information.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56				

PLEASE PRINT July H/SI

Name.....

Title.....

Firm.....

Street.....

City.....Zone.....State.....

This card is void after September 1, 1951

we're up to our necks in a paradox!

Prior to the introduction of M-12 and Amendments we urged you to use Revere Copper Water Tube. Now, with copper tube cut to a limited number of uses, as well as being in short supply, we will be unable to furnish the quantities you want or as fast as you would like. However, we still want to plug the merits of Revere Copper Water Tube, so that once it is again available in the desired quantities, you will again use it.
A paradoxical situation.
But paradox or no, we can still be of help to you with problems which present conditions will create. Actually, the limitations on Revere Copper Tube will probably result in an increase of activities on the part of Revere's Technical Advisory Service. Revere will be only too glad to work with you on your problems; give you the benefit of its knowledge gained from a century and a half of working with metals.
And don't forget, while general applications are limited, you can still use Revere Copper Water Tube in industrial processing lines, underground service lines and domestic hot and cold water lines. Check your Revere Distributor on the availability of these materials. He also will put you in touch with Revere's Technical Advisory Service in the event you wish to discuss your technical problems.

REVERE 150

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

• •

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.—Sales Offices in Principal Cities, Distributors Everywhere.

SEE "MEET THE PRESS" ON NBC TELEVISION EVERY SUNDAY

DEGREE-DAYS FOR MAY, 1951

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city.

HEATING AND VENTILATING's 23rd Year of Publication of Monthly Degree-Day Data

City	May			Cumulative, September 1 to May 31			Heating Season[1]
	1951	1950	Normal	1950-51	1949-50	Normal	Normal
Abilene, Texas (A)	7	18	0	2491	2207	2061	2061
Albany, New York (A)	220	238	183	6431	6831	6580	6580
Albuquerque, New Mexico (A)	81	50	40	3766	3852	4298	4298
Alpena, Michigan (C)	330	444	465	7598	7855	8127	8299*
Anaconda, Montana (C)	(a)	623	517	(a)	8348	8010	8357**
Asheville, North Carolina (C)	(a)	25	71	(a)	3568	4232	4232
Atlanta, Georgia (C)	19	7	0	2987	2453	2890	2890
Atlantic City, New Jersey (C)	139	266	220	4416	4447	5176	5176
Augusta, Georgia (A)	12	3	0	2637	1853	2161	2161
Baker, Oregon (C)	383	484	431	6442	7091	6950	7163
Baltimore, Maryland (C)	74	102	22	4134	3921	4533	4533
Billings, Montana (A)	249	463	316	7378	7682	7059	7119
Binghamton, New York (C)	222	227	254	6160	6279	6808	6808
Birmingham, Alabama (A)	(a)	0	0	(a)	2239	2352	2352
Bismarck, North Dakota (A)	257	435	338	9765	10057	9147	9192
Block Island, Rhode Island (A)	269	422	378	5044	5307	5689	5788
Boise, Idaho (A)	254	333	236	5375	6004	5552	5552
Boston, Massachusetts (A)	215	280	245	5069	5546	6045	6045
Bozeman, Montana (C)	(a)	554	471	(a)	8020	8195	8521**
Buffalo, New York (A)	246	250	335	6348	6443	6810	6822
Burlington, Iowa (A)	121	115	(a)	6624	6084	(a)	(a)
Burlington, Vermont (A)	302	223	273	7120	7482	7511	7514
Butte, Montana (C)	(a)	623	502	(a)	8602	7926	8235**
Cairo, Illinois (C)	30	32	0	4110	3497	3909	3909
Canton, New York (C)	(a)	301	334	(a)	7763	8020	8020
Charleston, South Carolina (C)	0	0	0	2031	1394	1769	1769
Charlotte, North Carolina (C)	29	9	0	3139	2696	3120	3120
Chattanooga, Tennesee (A)	46	0	0	3423	2872	3118	3118
Cheyenne, Wyoming (A)	422	575	446	7134	7113	7340	7466
Chicago, Illinois (C)	(a)	231	254	(a)	5880	6018	6077
Cincinnati, Ohio (C)	79	56	0	4770	4150	4684	4684
Cleveland, Ohio (A)	168	174	220	5974	5754	6155	6155
Columbia, Missouri (A)	76	51	22	5269	4688	4922	4922
Columbia, South Carolina (C)	10	3	0	2544	2057	2364	2364
Columbus, Ohio (C)	119	94	87	5452	4961	5398	5398
Concord, New Hampshire (A)	294	289	298	6678	7293	7299	7353
Concordia, Kansas (C)	83	106	65	5480	5342	5315	5315
Dallas, Texas (A)	5	2	0	2298	2078	2256	2256
Davenport, Iowa (C)	115	114	118	6587	6123	6289	6289
Dayton, Ohio (A)	127	120	81	5966	5396	5264	5264
Deer Lodge, Montana (C)	(a)	573	487	(a)	8255	8347	8672**
Denver, Colorado (C)	248	369	267	5798	5266	5874	5874
Des Moines, Iowa (A)	115	139	118	6890	6453	6384	6384
Detroit, Michigan (A)	192	211	573	6275	6271	6490	6490
Devils Lake, North Dakota (C)	255	509	424	10348	10905	9874	9970
Dodge City, Kansas (A)	102	137	47	5082	4853	5035	5035
Dubuque, Iowa (C)	173	159	149	7357	6795	6790	6790
Duluth, Minnesota (C)	411	590	521	9559	9728	9267	9483
Eastport, Maine (C)	472	485	543	6818	7399	7941	8520**
Elkins, West Virginia (A)	199	185	177	5810	5377	5697	5697
El Paso, Texas (A)	27	7	0	2373	2143	2428	2428
Ely, Nevada (A)	449	542	(a)	6885	7303	(a)	(a)
Erie, Pennsylvania (C)	224	234	257	5869	5779	6273	6273
Escanaba, Michigan (C)	345	491	490	8244	8544	8608	8771
Evansville, Indiana (A)	74	58	0	4969	4242	4244	4244
Fort Smith, Arkansas (A)	21	12	0	3478	3108	3147	3147
Fort Wayne, Indiana (A)	174	142	130	6419	6047	5925	5925
Fort Worth, Texas (A)	5	4	0	2328	2113	2148	2148
Fresno, California (A)	56	72	0	2254	2610	2334	2334
Galveston, Texas (C)	0	0	0	1115	653	1016	1016
Grand Junction, Colorado (A)	151	196	118	5261	5619	5548	5548
Grand Rapids, Michigan (A)	202	224	174	6712	6428	6535	6535
Green Bay, Wisconsin (C)	234	380	322	8357	8316	7825	7825
Greensboro, North Carolina (A)	49	29	0	3940	3470	3529	3539
Greenville, South Carolina (A)	20	7	0	3264	2849	3380	3380
Harrisburg, Pennsylvania (A)	133	140	90	5233	5114	5375	5375
Hartford, Connecticut (A)	179	236	17	5502	5953	2531	6036
Hatteras, North Carolina (C)	17	22	0	2531	1891	2571	2571
Havre, Montana (C)	275	371	369	8734	9255	8556	8700
Helena, Montana (A)	394	506	402	8321	8489	7663	7894**
Houston, Texas (C)	0	0	0	1209	852	1157	1157
Huron, South Dakota (A)	213	349	267	8304	8564	8004	8004
Indianapolis, Indiana (A)	113	92	59	5935	5276	5298	5298
Jackson, Mississippi (A)	3	0	(a)	2300	1729	(a)	(a)
Kansas City, Missouri (A)	55	38	6	5119	4733	4956	4956
Knoxville, Tennessee (A)	55	3	0	3751	3128	3670	3670
La Crosse, Wisconsin (A)	113	246	183	8079	8046	7322	7322
Lander, Wyoming (A)	393	586	428	7421	7720	7812	7947

(a) Data not available.

[1]Figures in this column are normal totals for a complete heating season, September to June, inclusive.

Figures in this table, with seven exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y., and Norman E. Ross, Bursar, Bates College, Lewiston, Me., respectively; Anaconda, Bozeman, Butte, Deer Lodge and Livingston, Mont., through the courtesy of the Montana Power Company.

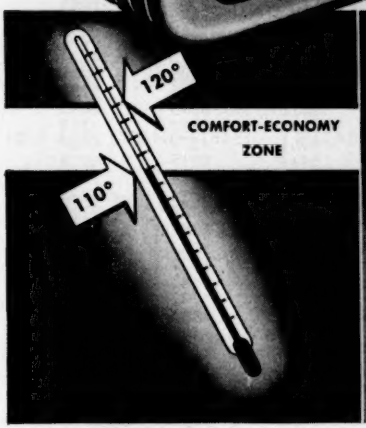
[Table concluded on page 106]

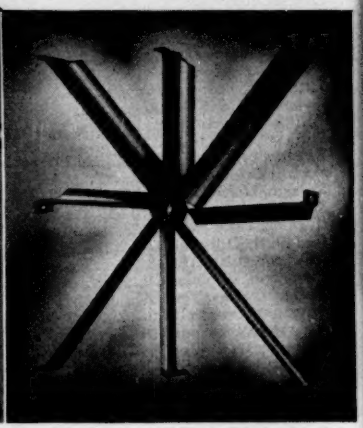
Engineers Rate Modine the
Standard of Excellence

COMPARE FIRST...

...YOU'LL CHOOSE

MODINE UNIT HEATERS





Discharge air temperatures of 110°-120° F. . . . correctly related to air velocities assure perfect heating comfort, lower fuel costs.

Direct-from-pipe suspension is safe and economical. Heated air stream may be easily re-directed over full 360° range.

Built-in velocity generator effectively steps up heat-throw, permitting positive penetration of cold air strata near floor.

Three of many outstanding features which account for the Modine quality reputation

Whether you choose Modine *Horizontal, Vertical* or *Power-Throw* Unit Heaters you are assured of unequaled heating performance — high fuel economy — low operating and maintenance costs . . . for years and years. Beautifully styled — yes! But it's the advanced engineering design features, highest grade materials and workmanship that account for this famous Modine built-in quality. No wonder engineers rate Modine the standard of excellence among unit heaters. *Yes, compare first . . . and you too will choose Modines.* Modine Manufacturing Co., 1511 Dekoven Ave., Racine, Wisconsin.

Ask for Modine Unit Heater Bulletin 149A. Also available — bulletins covering special applications in commercial brooder houses, greenhouses, milk houses and many other applications.

***Modine* UNIT HEATERS**

Degree-Days for May, 1951 (Concluded)

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city.

HEATING AND VENTILATING's 23rd Year of Publication of Monthly Degree-Day Data

City	May			Cumulative, September 1 to May 31			Heating Season[1]
	1951	1950	Normal	1950-51	1949-50	Normal	Normal
Lansing, Michigan (A)	209	229	229	6864	6840	7048	7048
Lewiston, Maine (O)	288	(a)	344	6670	(a)	7662	7707
Lincoln, Nebraska (C)	95	153	99	6130	6012	5999	5999
Little Rock, Arkansas (A)	18	18	0	3186	2711	2811	2811
Livingston, Montana (C)	(a)	486	405	(a)	7227	7043	7245**
Los Angeles, California (C)	69	98	90	1124	1470	1504	1504
Louisville, Kentucky (A)	68	59	0	4777	4020	4180	4180
Lynchburg, Virginia (A)	82	71	0	4302	3834	3980	3980
Macon, Georgia (A)	5	2	0	2322	1788	2201	2201
Madison, Wisconsin (C)	170	226	236	7539	7284	7429	7429
Marquette, Michigan (C)	365	505	496	8203	8525	8464	8693*
Memphis, Tennessee (A)	33	4	0	3384	2838	2950	2950
Meridian, Mississippi (A)	11	0	0	2449	1877	2160	2160
Milwaukee, Wisconsin (A)	240	349	350	7370	7091	7206	7245
Minneapolis, Minnesota (A)	132	287	236	8406	8348	7850	7850
Montgomery, Alabama (A)	4	0	0	2295	1544	1884	1884
Nantucket, Massachusetts (A)	331	443	384	5247	5631	5834	5957
Nashville, Tennessee (A)	60	8	0	3987	3310	3507	3507
New Haven, Connecticut (A)	202	309	223	5334	5696	5895	5895
New Orleans, Louisiana (C)	0	0	0	1226	775	1024	1024
New York, N. Y. (C)	121	204	171	4591	4643	5244	5274***
Nome, Alaska† (A)	1171	1294	1443	14815	10958	12085	14580**
Norfolk, Virginia (C)	45	62	0	3144	2736	3350	3350
North Head, Washington (C)	391	491	422	4611	4960	4693	5452**
North Platte, Nebraska (A)	207	291	199	6438	6636	6366	6366
Oakland, California (A)	162	236	205	2367	3018	2870	3143**
Oklahoma City, Oklahoma (C)	27	42	0	3562	3319	3613	3613
Omaha, Nebraska (A)	94	142	84	6517	6288	6131	6131
Oswego, New York (C)	302	301	357	6469	6608	7025	7088
Parkersburg, W. Virginia (C)	84	80	53	4875	4429	4775	4775
Peoria, Illinois (A)	123	97	121	6411	5913	6109	6109
Philadelphia, Pennsylvania (C)	85	148	115	4366	4348	4720	4737***
Phoenix, Arizona (C)	15	5	0	1019	1124	1405	1405
Pittsburgh, Pennsylvania (C)	113	98	78	5252	4818	5235	5235
Pocatello, Idaho (A)	279	398	332	6357	6875	6595	6655
Portland, Maine (A)	347	371	666	6754	7359	7137	7218
Portland, Oregon (C)	207	259	245	3919	4551	4379	4469
Providence, Rhode Island (C)	189	252	251	4931	5444	6015	6015
Pueblo, Colorado (A)	175	217	186	5458	5041	5514	5514
Raleigh, North Carolina (C)	29	28	0	3202	2747	3234	3234
Rapid City, South Dakota (A)	276	449	344	7329	7831	7088	7118
Reading, Pennsylvania (C)	99	156	96	4825	4844	5389	5389
Red Bluff, California (A)	79	80	(a)	2504	2820	(a)	(a)
Reno, Nevada (A)	348	338	366	5338	5790	5802	5892
Richmond, Virginia (C)	59	66	0	3751	3313	3695	3695
Rochester, New York (A)	237	253	260	6421	6599	6732	6732
Roseburg, Oregon (C)	(a)	(a)	267	(a)	(a)	4314	4428
Roswell, New Mexico (A)	42	20	0	3339	3123	3484	3484
Sacramento, California (C)	80	95	53	2305	2603	2653	2653
St. Joseph, Missouri (A)	75	61	16	5669	5371	5161	5161
St. Louis, Missouri (C)	55	41	0	4971	4258	4585	4585
Salt Lake City, Utah (A)	198	334	236	5950	5831	5555	5555
San Antonio, Texas (A)	2	0	0	1564	1152	1202	1202
San Diego, California (A)	79	111	115	1222	1552	1639	1645
Sandusky, Ohio (C)	168	174	183	5848	5490	6208	6208
San Francisco, California (C)	240	316	264	2431	2790	2681	3264**
Sault Ste. Marie, Michigan (A)	363	507	502	8536	9183	8950	9285**
Savannah, Georgia (A)	0	0	0	2041	1333	1490	1490
Scranton, Pennsylvania (C)	166	181	171	5685	5787	6129	6129
Seattle, Washington (C)	244	332	316	4177	4796	4695	4934**
Sheridan, Wyoming (A)	296	496	403	7429	7987	7888	8008
Shreveport, Louisiana (A)	4	0	0	2258	1807	1938	1938
Sioux City, Iowa (A)	135	231	164	7233	7276	6898	6898
Spokane, Washington (A)	321	390	285	6368	7302	6274	6355
Springfield, Illinois (C)	67	75	56	5663	5026	5373	5373
Springfield, Missouri (A)	97	66	12	4854	4438	4428	4428
Syracuse, New York (A)	249	228	267	6515	6553	6881	6893
Tacoma, Washington (C)	291	372	332	4577	5123	4883	5181**
Terre Haute, Indiana (A)	112	65	0	5812	5089	4872	4872
Toledo, Ohio (A)	180	194	180	6357	6114	6077	6077
Topeka, Kansas (C)	59	57	34	5130	4875	4969	4969
Trenton, New Jersey (C)	124	176	81	4792	4833	4933	4933
Utica, New York (O)	244	252	253	6338	6841	6796	6796
Valentine, Nebraska (C)	255	366	273	7237	7563	7039	7039
Walla Walla, Washington (C)	152	206	171	4573	5420	4808	4808
Washington, D. C. (C)	68	78	25	4077	3808	4626	4626
Wichita, Kansas (A)	69	74	0	4752	4509	4673	4673
Williston, North Dakota (C)	278	443	362	9722	10119	9269	9323
Winnemucca, Nevada (C)	334	386	324	5702	6317	6274	6427**
Yakima, Washington (A)	240	259	186	4418	6457	5599	5599

(a) Data not available.
†Nome data are for April

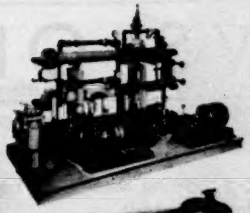
*Includes August.
**Includes July and August.
***New 48-year normal covering 1898 to 1946.

[1]Figures in this column are normal totals for a complete heating season, September to June, inclusive.

Paracoil SINCE 1915
FUEL OIL HEATERS

Paracoil Vertical Type Tank Suction Heater. (For Buried Tank Installations.)

- PARACOIL has been part and parcel of the oil burner industry from its inception and [illegible]
- PARACOIL builds every [illegible] of fuel oil heater used in the industry, with capacities to [illegible] BTU/hr. [illegible] without limitation.
- PARACOIL heaters are [illegible] rated. Maximum heat transfer, low pressure losses, long operating life at top output, and freedom from service shut-downs are [illegible] Paracoil Oil Heaters.
- PARACOIL [illegible] models is the answer. Heavy factory stocks permit quick delivery on catalogued models and sizes.



Paracoil Fuel Oil Heaters on Pump Set Assemblies. Our Tubular and Straight Tube Types are used by all leading pump set fabricators.

Paracoil Tank Suction Fuel Oil Heater. For Preheating Oil in Storage.

Paracoil Tubular Type Fuel Oil Heater. For High Pressure Steam Service. (Also made in Self-Cleaning Models.)

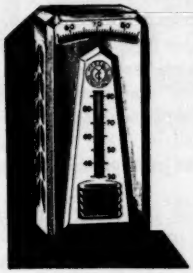
Paracoil "U" Tube Type Fuel Oil Heater. For Below Water Line Service.

Paracoil Line Type Fuel Oil Heater. For Bulk Station Operation.

DAVIS ENGINEERING
CORPORATION

1058 EAST GRAND STREET ELIZABETH 4, NEW JERSEY

MERCOID



for Even Room Temperature Control

a natural in
GOOD ENGINEERING

It is governed by the changes in room temperature only.

It has the inherent sensitivity to react quickly from its surrounding temperature to maintain room comfort without the aid of artificial stimulation.

It incorporates a Mercoid magnetic mercury contact switch—an assurance of long trouble-free service.

In appearance, its design and lustrous champagne tone finish is a gem on the wall of any interior decoration where it reflects its own environment. So easy to keep clean—a damp cloth with a little soap quickly removes all specks, dirt, etc. It does not tarnish or discolor with age and will remain permanently beautiful and new looking.

Experience among householders over the years has demonstrated that the Mercoid Sensatherm is meeting with general all around satisfaction. Since the day it made its advent in the automatic heating field there has been an ever increasing demand for this fine instrument.

It rests on its own record of dependable performance.

Write for new, complete catalog

THE MERCOID CORPORATION • 4201 BELMONT AV., CHICAGO 41, ILL.

ORAN offers the unique NEW DUAL-AIR vaporizing burner in ALL Shallo-Well Oil Fired floor furnaces

Underwriters' Listed

Only 34" deep, NO GROUND CLEARANCE NEEDED!

Oran's amazing, new Dual-Air vaporizing burner is one of the greatest advancements ever made in vaporizing-type burners. This unique unit burns smoke-free, even under adverse draft conditions, with oil savings up to 15%!

There are four Oran Shallo-Well models for small homes, to meet climatic conditions anywhere in the nation.

- 50,000 BTU output—Natural draft
- 50,000 BTU output—Forced draft
- 65,000 BTU output—Forced draft
- 75,000 BTU output—Forced draft

WRITE US TODAY FOR COMPLETE INFORMATION ON THESE UNIQUE SHALLO-WELL OIL-FIRED FLOOR FURNACES!

ORAN COMPANY

2212 S. Third St., Columbus 7, Ohio

ORAN

NEWS OF THE MONTH

NDHA ANNUAL MEETING

national district heating association holds 42nd annual meeting in Detroit.

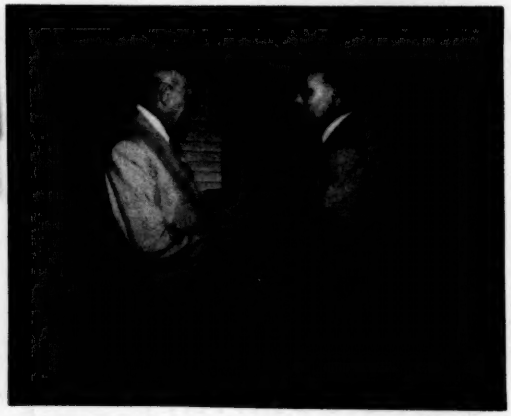
The National District Heating Association held its 42nd Annual Meeting in Detroit from June 5 to June 8. President George H. Tuttle opened the meeting with an address in which he pointed out some of the accomplishments of the Association during 1950 and problems facing the district heating industry.

• **HANDBOOK.** — The outstanding accomplishment, in Mr. Tuttle's opinion, was the final editing, publishing, and distributing of the third edition of the District Heating Handbook. This Handbook serves as a valuable guide to the membership of the association and presents a comprehensive picture of all phases of the district heating industry to those not already familiar with it. The publishing of the Handbook was the responsibility of the educational committee under the chairmanship of J. Earle Seiter, Consolidated Gas Electric Light and Power Co. of Baltimore. President Tuttle presented a morocco-bound copy of the Handbook to Mr. Seiter at the opening luncheon.

Mr. Tuttle reported that the membership of the association was at an all-time high due to efforts of the membership committee under the chairmanship of Frank B. Mahon, Allegheny County Steam Co.

• **STEAM LOSSES.**—In pointing out some of the problems of the district heating industry, Mr. Tuttle likened them to the problems facing the industry in 1937, when the annual meeting was last held in Detroit. He stated that, although tremendous progress has been made in the intervening years, one problem that was widely discussed at both meetings was that of steam losses. About half of the steam losses between the steam heating plants and customers' meters are classified as unaccounted-for losses. Since this is such a major problem, the association has established a procedure for a literature research of all papers dealing with steam losses in an effort to reduce the so-called unaccounted-for losses. It is also planned to make further studies to determine the effect of superheat and velocity on line losses.

Officers, NDHA, 1951-1952: Rear row (directors) Norman W. Calvert, Fred W. Deutsch, Vernon J. Suche, Edward J. Flahie, Lee C. Killen; secretary-treasurer, John F. Collins, Jr. Front row, third vice president, Thomas P. Brown, Jr.; second vice president, Charles W. Deeg; president, Alfred T. Veness; first vice president, Percy A. Hyde; past president and director, George H. Tuttle.



President George Tuttle (right) presenting leather-bound copy of District Heating Handbook to J. Earle Seiter, chairman of educational committee.

• **SALES.**—The continued rapid growth of the district heating industry was indicated by the reports of the operating statistics and sales development committees. Foster L. Stephens, The Allegheny County Steam Co., chairman of the operating statistics committee to which 55 steam utilities supplied statistics, reported that there was an increase of 7.8% in steam sales for 1950 over 1949. A large part of this increase was due to colder weather.

The total revenue for the reporting companies increased from $57 million in 1949 to $63 million in 1950, an increase of over 10% with only four companies reporting decreases. The average revenue or rate per thousand pounds of steam increased 2.2% with about half the companies reporting a decrease. Most of the decreases were due to a higher percentage of the steam being sold in the lower rate blocks as a result of the colder weather.

The unit cost of coal remained about the same, indicating at least a temporary peak.

There was a 5.35% increase in the total hourly wage cost, although there was a small decrease in the number of employes.

The capital investment increased about 4½% during 1950 and the proposed new investments for 1951 are 32% less than in 1950.

If your COOLING TOWER SPECIFICATIONS read...

1 Must save water
2 Must be independent of natural air movement
3 Must be quiet

Specify Binks type B mechanical draft towers

Binks type B Towers use a proved spraying process to transfer heat from the circulating water to the atmosphere, permitting its use over and over again.

Binks type B use built-in blowers to provide *controlled* air movement through the tower. They are independent of natural breeze ...hence can be operated indoors or outdoors.

Binks type B towers operate *quietly* because the squirrel-cage blowers provide ample air movement while running at slow speeds.

Binks Type 2-B Tower

The non-clogging ROTO-JET nozzles in a Binks tower produce maximum cooling because their whirl chamber design causes fine fluid break-up.

Send for this literature for details:
Bulletin 46—Type 2-B (3 to 90 GPM)
Bulletin 47—Type 2-BB (96 to 180 GPM)

THERE'S A BINKS TOWER FOR EVERY COOLING JOB

Binks MANUFACTURING COMPANY

REPRESENTATIVES IN ALL PRINCIPAL CITIES ■ 3120-38 CARROLL AVENUE, CHICAGO, ILL.

SKINNER V2-type VALVE

★ relief
★ shut-off
★ drip-eliminator

OUTSTANDING PERFORMANCE & ECONOMY

On original oil burner equipment or for service replacement, new standards of performance are yours with the low-cost Skinner V2 Solenoid Valve! Sturdy steel parts are plated to resist corrosion — compact — weighs only 9 oz. — usable in any position! Soft synthetic seat and seals prevent leakage, and spring loading assures positive operation. There are no brazed, welded, soldered pressure joints, or threaded parts to loosen under vibration. Maximum pressure is 125 P.S.I. — rated at 10 watts max. — Underwriters' approved. Relief model is 2 way, normally open. Drip-eliminator or shut-off is 2 way, normally closed.

Write for details and low prices!

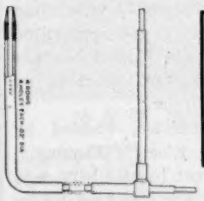
Skinner ELECTRIC VALVE DIV.

THE SKINNER CHUCK COMPANY
136 Belden Ave., Norwalk, Conn.

Rule Out Guesswork!

Portable and stationary Inclined and Vertical Draft Gages. Level and tube replaceable in field. Constant zero. Bulletin 109.

Air Filter Gages for measuring resistance in air conditioning ducts. Bulletin 114.



Be Sure with ELLISON Instruments

Pitot Tubes for air and gas flow measurements. Angle and straight stem types, brass for temperatures to 500°F., stainless steel for temperatures to 1000°F. Bulletin 109.

PORTABLE GAS ANALYZERS

Accurate, easy to use Combustion Testing Set equipped for analysis of CO_2, O_2 and CO, complete with flue gas thermometer. Bulletin 120.

ELLISON DRAFT GAGE CO.

211 W. KINZIE ST. Since 1896 CHICAGO 10, ILL.

THE ELLISON LINE ALSO INCLUDES:

Dial Draft Gages—Bell Type · Inclined Draft Gages—Portable Inclined Vertical Tube Gages · Vertical Tube Gages—Oil, Heavy Liquid and Mercury—Single and Multi-Tube · Saturator Gages U Gages—Stationary and Portable · Air Filter Gages—Dial and Inclined Tube Types · Pitot Tubes · U Path Steam Calorimeters Portable Gas Analyzers—Orsat Type

Sterling S. Sanford, The Detroit Edison Co., reporting 1950 sales statistics for the sales development committee, stated that 984 new customers were added in 52 cities. The estimated annual steam consumption of these new customers is about 2½ billion pounds and the estimated annual revenue almost $3 million. Old buildings using district heating steam for the first time accounted for 570 of the new customers. There were 219 new customers in new buildings. The remaining 195 new customers were old buildings which at some previous time had used district heating steam service. Stores and restaurants accounted for most of the new customers.

In five cities there was a gain in electric revenue through shutdown of private generating plants in connection with securing the heating business. This new electric revenue in 1950 amounted to $73,766.00.

Twelve companies reported that they do not have sufficient boiler capacity for serving prospective customers and in only one of these are there plans for increasing the capacity in 1951. Eight companies added a total boiler capacity of 655,000 lb of steam per hour during 1950. Four companies plan to add a total capacity of 530,000 lb per hour in 1951. Steam distribution facilities are insufficient in six cities and in only one of these are there plans for increasing distribution capacity in 1951.

• **AIR CONDITIONING.**—The air conditioning committee under the chairmanship of Robert D. Martin, New York Steam Corp., presented three papers on summer air conditioning with district heating steam. Wirt S. Scott, Philadelphia Electric Co., gave the reasons for the selection of steam absorption equipment (450 tons) for a new apartment development in Philadelphia. He stated that original plans specified mechanical equipment because of its lower initial cost. A review was made in which operating costs were given full consideration and as a result the steam absorption equipment was favored.

John A. Gilbreath, Servel, Inc., described a new 20-ton chilled water unit that his company is producing.

E. J. Benesch, Syska and Hennessy, Inc., presented a paper describing the design of the United Nations Headquarters air conditioning system, operated by turbocompressor refrigeration equipment.

The commercial relations committee, headed by Arthur T. Lukens, Philadelphia Electric Company, presented several reports of interest to members, and Percy A. Hyde, Ohio Edison Co., stressed the importance of good commercial relations.

• **RESEARCH.**—Several years ago the research committee reported on a study that indicated that steam consumption comparisons on an adjusted exposure basis were more equitable than on a building volume basis. This is true primarily because of the wide variations in the ratios of exposure to volume for different buildings. The adjusted exposure is the sum of the net wall area, four times the glass area, and two times the roof area. This takes into account the variations in the heat transfer coefficients of the wall, windows, and roof.

F. Lee Rapson, Consolidated Gas Electric Light and Power Co. of Baltimore, of the commercial relations committee, compiled data for about 150 buildings in different cities. His data indicated that there is much less variation in steam consumption comparisons of buildings when made on the adjusted exposure area than when made on the volume basis.

Carl B. Sprenger, The Detroit Edison Co., also a member of the commercial relations committee, discussed a study which was made to determine the effect on the maximum hourly steam demand and the total consumption of a building by leaving steam on for 24 hours per day during extremely cold weather. He pointed out that the total steam consumption would be increased somewhat but that the decrease in maximum hourly demand by this kind of operation justifies the consideration of rates which would encourage it. By decreasing the maximum steam demands of buildings now being served by district heating steam, additional boiler capacity would be made available in existing facilities to serve new business.

• **DISTRIBUTION.**—George K. Saurwein, Negea Service Corp., and his distribution committee, presented Homer F. Hatfield and Robert H. Swoyer, Pennsylvania Power and Light Co., who described the use of a d.c. calculating table for the determination of pressure gradients in district steam systems. Alexander Douglas, The Cleveland Electric Illuminating Co., explained what they are doing in his company to mechanize underground steam main construction. He stated that they are making tremendous savings in construction costs by the use of mechanized equipment. One piece of equipment with which they are most pleased is a pavement cutting machine. It has two large wheels with tungsten carbide-tipped bits which saw 2-inch slots in pavement 18 to 54 inches apart. The 15-ton machine is mounted on four solid rubber tires and is powered by a 75-horsepower gasoline engine. It travels from job to job on its own power and is capable of cutting pavement to depths of 15 inches at a rate of four feet per minute. It is relatively quiet and has resulted in savings in direct labor costs of nearly 85% over the air hammer and hand loading method of removing pavement. Total savings, including equipment costs, are estimated at about 48%. Mr. Douglas's talk was followed by moving pictures which showed the mechanical equipment in operation.

Another part of the distribution committee's program that aroused considerable interest was a paper by E. T. Smith and E. E. Dubry, The Detroit Edison Co., relating experiences encountered while conducting tests on water hammer in steam mains. The test arrangement consists of 60 feet of 16-inch pipe installed so that there is a pocket or low point about 20 feet from the end to which is connected a 4-inch 30 psi steam supply line. The authors stated that, with about 8 inches of water at the low point of the pipe, pressure surges of about 7,000 psi have been recorded. The duration of these surges were about 1/10,000 second. Mr. Smith staged an actual demonstration of the water hammer test for a large number of interested and amazed spectators.

BUY The DIFFERENCE
. . . at No Extra Cost

Only Airsan offers you ALL these filtering features—

- *galvanized steel frames*
- *bronze welded corners*
- *drain slots for quick, easy cleaning*
- *expanded metal face plates act as lint arrestors*

Airsan Air Filters are viscous type, permanent and cleanable. Write for free bulletins.

Air Filter Corporation
108 H NORTH WATER ST. • MILWAUKEE, WIS.
Canadian Representative
DOUGLAS ENGINEERING CO., LTD., MONTREAL
A Few Distributorships Available. Write for Details.

. . . here are the reasons why

Grant Wilson
DUX-SULATION
is **BEST FOR DUCT INSULATION**

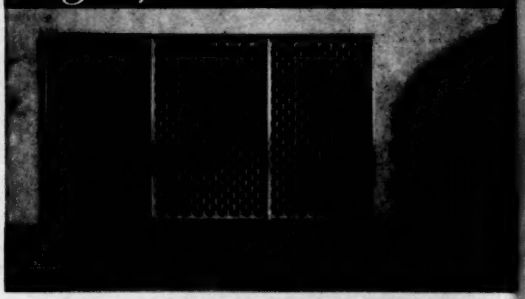
1. High thermal and acoustical insulating properties . . . K factor of .27 BTU and sound absorption approximately 61%. Integral, woven asbestos membrane.
2. Easy to handle, easy to install correctly, can't be crushed or cracked, springs back to original thickness if compressed. Supplied with special glue and tape, no "fasteners" needed.
3. Constant insulating values. Can't "powder", shift or sift; no thin spots, even at corners. No deterioration of any kind, no change of any kind.
4. Perfect adhesion, flexible, conforms to uneven surfaces. Can be installed in the shop and still withstand all necessary handling. Specifically engineered for duct application ONLY!

Inspect Dux-Sulation yourself!
Write Grant Wilson, Inc. 141 West Jackson Blvd., Dept. E, Chicago 4, Illinois.

Grant Wilson Inc.

IN NEW YORK CITY: Air Conditioning Utilities Co., 8 West 40th Street, New York 18, N. Y., LOngacre 3-4280.
IN CANADA: Atlas Asbestos Co., Ltd., Montreal, Toronto, Winnipeg, Vancouver.

Graceful **CONCEALMENT**



H & K ORNAMENTAL GRILLES

Request Catalog #33

You will find that H & K Grilles combine the ultimate in grille art with rugged protection and adequate air circulation for all purposes.
Our wide selection of distinguished patterns—modern and classical—are perforated in finely finished, unbreakable metal plates.
We will recommend the best and most durable metal available for your purpose.
There is practically no limitation to the size, shape or form of Grilles we can furnish. They may be rectangular, square, round or odd in shape and flat, curved or angular in form.
Frames, louvers, invisible hand hole doors and registers can be furnished to meet exacting specifications.

The Harrington & King Perforating Co.
5664 Fillmore St., Chgo. 44 — 114 Liberty St., N. Y. 6

architect . . Gustave W. Iser

and

engineer . . R.W. Billharz

United on Sarcotherm Modulating Heat Control

to give these outstanding apartments perfect heating comfort under all weather conditions.

Yes, team work pays! It brings increased efficiency as well as superior design.

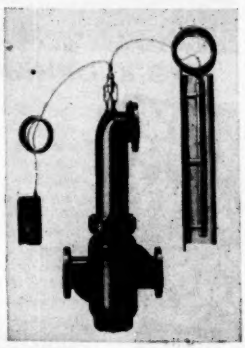
The addition of Sarcotherm, the simple modulating outdoor control, made sure of owner satisfaction.

RUMSEY GARDENS YONKERS, N.Y.

BEECHWOOD VILLAGE AUBURNDALE, N.Y.

ASK A SARCOTHERM ENGINEER to see you today. There is one near you. Or write for new bulletin ST 5012.

Typical centralized program panel for fully automatic operation as in apartments, hospitals or institutions.



Sarcotherm weather-compensated control valve.

Sarcotherm No. 20-A

SARCOTHERM CONTROLS INC • Empire State Bldg • NEW YORK 1 N Y

P. A. Hyde, Ohio Edison Company, explained how his company restored pressure at the extremities of the steam distribution system by installing a 16-inch loop line. R. E. Needham, S. E. Dockstader, Inc., described the construction of a steam main extension from the Pentagon Building to the Naval Annex in Washington, D. C. The construction involved the installation of a steam main, a condensate return line, and a high pressure drip line in a concrete conduit. The conduit was filled with low density insulating concrete after the piping was in place.

"Construction Features of the 16-inch Steam Service to Henry Ford Hospital" was the title of a paper presented by W. D. McCully, The Detroit Edison Company. In his paper, Mr. McCully described the construction of 11,500 feet of 16-inch main to serve a large hospital in Detroit. The installation required the crossing of a depressed expressway at two locations. The solution arrived at was to cross at one location, where the roadway is not yet depressed, with the provision that the main will be relocated later in a bridge to be built one block north of the temporary crossing. The other crossing was made within the structure of an existing railway bridge.

• **OFFICERS.**—At the closing session of the meeting, the new officers for the coming year were inducted into office. They are as follows: Alfred T. Veness, Rochester Gas and Electric Co., Rochester, N. Y., president; Percy A. Hyde, Ohio Edison Co., Akron, Ohio, 1st vice president; Charles W. Deeg, Philadelphia Electric Co., Philadelphia, Pa., 2nd vice president; Thomas P. Brown, Jr., New York Steam Corp., New York, N. Y., 3rd vice president.

Vernon J. Suche, Union Electric Co. of Missouri, St. Louis, Mo., and Norman W. Calvert, Spence Engineering Co., Inc., were elected to the executive board for two-year terms.—ERNEST T. SMITH, *The Detroit Edison Co.*

STEEL SCRAP

inventories dangerously low, says AISI.

Inventories of heavy iron and steel scrap at the nation's steel plants and foundries are dangerously low. Supplies on hand are fluctuating between days and only a few weeks as compared with normal, safe-working inventories of about 60 days, according to American Iron and Steel Institute Committee on Scrap Iron and Steel. Factors such as war exports and peak production have combined to temporarily disrupt the scrap cycle—steel from mill to product and back to mill again.

This cycle must be restored quickly, not only to maintain production now but also to build up depleted inventories to carry mills through the coming winter months when seasonal collections normally fall off.

• **CLEANUP.**—Here is a sample of what happened during World War II when industries which would not normally be thought of as producing a big volume of scrap really got to work on the job. The Eastman-Kodak Company normally would not have been considered a prime producer of scrap. During one of its

scrap drives, however, Eastman found 88 carloads of dormant scrap around its plants within a 3-month period. Ever since that experience, the Eastman Company has had an alert procedure of removing obsolete equipment from inventory on a regular basis.

• **MORE NEEDED.**—Countless other tons of dormant iron and steel scrap are available in various areas of the United States. Their presence is urgently required at the nation's steel mills if production is to be maintained to help meet the greatest combination of military-civilian requirements any country's steel industry has ever faced.

$1000 INDUSTRIAL PRESS AWARD

for proving need for specific advertising won by machine tool advertising manager.

The Industrial Press Award of $1000, established by the publishers of HEATING AND VENTILATING for the industrial advertising man who made during the year the best documented presentation to his management to prove the need for a specific advertising program and showed how that program filled the need, was won by Joseph T. Vinbury, advertising manager of the New Britain Machine Co., New Britain, Conn.

The Award was presented to Mr. Vinbury June 26 at the annual convention in New York of the National Industrial Advertisers Association, a committee of which judged the entries.

• **JUDGES.**—The panel of judges consisted of John McConnell, vice president, American Air Filter Co., Louisville; C. S. Stackpole, vice president and general manager, Air-Temp Division, Chrysler Corporation, Dayton, Ohio; T. Spencer Shore, president, Eagle-Picher Co., Cincinnati; M. R. Greiser, president, Carthage Mills, Inc., Cincinnati; and George H. Lynn, general sales manager, Baldwin-Lima-Hamilton Corporation, Hamilton, Ohio.

Panel of judges established by NIAA to determine winner of The Industrial Press Award. Seated, left to right, J. McConnell, C. S. Stackpole, G. H. Lynn. Standing, left to right, M. R. Greiser, T. S. Shore.

• **WINNER.**—Following his graduation from Boston

TITUSVILLE "Compact"
SPLIT FIREBOX
Boilers
Left: Assembled view of Titusville "Compact" Split Firebox Boiler.
TITUSVILLE
IRON WORKS CO
TITUSVILLE, PA.
Right: The Titusville "Compact" Split Firebox Boiler with sections opened, suggesting ease of manipulation.

For replacement installations where entrance conditions are not sufficient for the standard boiler, Titusville "Compact" Steel Boilers are obtainable in split firebox design. This practical expedient permits passage of the boiler in unit sections through narrow openings, with easy reassembly. Send us your replacement problem, and let us recommend the best solution for you! Request Bulletin Form C-7959 for Clearance Dimensions.

With This NEW Improvement Niagara "No-Frost Method" puts you a big step ahead in trouble-free, automatic refrigeration or freezing

Niagara "No-Frost Method" keeps frost and ice COMPLETELY OUT of your cooling, chilling, freezing or cold storage.

It uses Niagara No-Frost Liquid Spray to keep frost and ice from ever forming. It gives you, automatically, refrigeration with no defrosting, and full capacity NEVER cut down by ice building up progressively on refrigeration coils.

Now, a NEW design No-Frost Liquid concentrator, using a new principle, takes away moisture as fast as it is condensed by evaporating it at low temperature —not boiling it away at high temperature. It has 14 times the capacity of the old method per dollar of investment — one concentrator will handle a battery of high capacity spray coolers.

This gives you more refrigeration at lower cost; less machinery in less space. You operate at high suction pressure, saving power and wear and tear on compressors.

The extra capacity and lower cost both for equipment and operating makes this method advantageous for every type of refrigeration use—both for freezing and for moderate temperatures—for large "live" loads as in meat chilling or in fruit and vegetable precooling — for rooms that are filled and emptied of product daily, such as milk rooms and terminal storage warehouses.

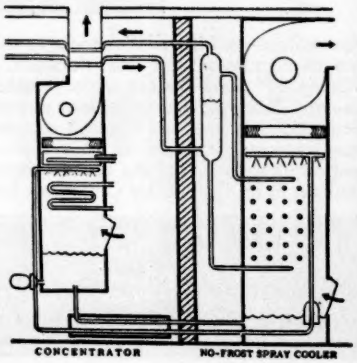
You get true trouble-free refrigeration . . . No brine . . . no salt solution . . . no dirt . . . no mess . . . It is entirely clean; you get rid of dirt and odors. You reduce both equipment and operating costs.

For complete information write to the Niagara Blower Company, Dept. HV, 405 Lexington Avenue, New York 17, New York.

If you need extra capacity . . . the Niagara "No-Frost Method" can help you get it with your present compressor.

•

A simple method, easily maintained. Saves a third of your refrigeration cost . . . Ask for Niagara Bulletins 118 and 119.



College in 1940, Mr. Vinbury worked for the Hamilton Standard Division of the United Aircraft Corporation where he gained practical experience in the operation of machine tools. From 1942 to 1943, he was with the Army Air Corps after which he became a teacher of English and physical education. In 1946, he became advertising manager of the New Britain Machine Co. Mr. Vinbury at present is chairman of the New England Machine Tool Builders' Advertising Council.

Entries receiving honorable mention were those of Alfred H. Roth, Towmotor Corporation; John I. Carr, Owens-Illinois Glass Co.; and Frank Little, Precision Scientific Co.

• **OBJECTIVE.**—In presenting the Award to Mr. Vinbury, Robert B. Luchars, president of The Industrial Press, pointed out that advertising managers are at times painfully conscious of the fact that sound advertising is not always encouraged by top management officials and that on occasion it is actively opposed. As a result, many able advertising men have sometimes found themselves seriously hampered in their effort to develop an effective program of industrial advertising for the organizations with whom they are connected.

Mr. Luchars went on to say that the indifference or active hostility toward sound industrial advertising springs from a variety of causes, the commonest one being the failure on the part of some top company executives to see the need for advertising or to recognize its practical value. Most top-ranking industrial executives are realistic and ready to face facts. However, no executive can be enthusiastic about something for which he sees no practical need. He said the job, then, is to establish the need for advertising so that it will be fully recognized and understood. That means assembling and presenting pertinent and thoroughly authenticated facts which give a clear picture of what must be done to keep pace with the fast-moving parade of new market requirements, personnel changes, product developments, and competitors' activities.

The supposition that the sales promotion job can be done completely by the personal selling staff, is a fallacy that arises chiefly from lack of first-hand contact with field conditions and the consequent failure to understand the serious gaps and weak spots that exist in the front-line of even the best personal selling organizations, Mr. Luchars said.

Once top management has been shown that there are such gaps and weak spots, he continued, the vulnerability of sole dependence on the personal sales force becomes apparent and the need to plug the gaps and reinforce the weak spots is immediately evident. There can no longer be any reasonable room for doubt that something needs to be added, and an advertising program built to conform to the needs pattern will commend itself strongly and should be relatively easy to sell.

Mr. Luchars then explained that the objective of The Industrial Press Award is to encourage advertising men to develop a convincing presentation to their top company management, showing why and where advertising is needed to supplement and reinforce activities of the selling staff or otherwise to perform

essential development work, and outlining a program of advertising that fits the pattern of that need. The idea was that such a competition would help stimulate effective action along these lines, encouraging and assisting others who might be in the need of help, by demonstrating not only that this sort of job could be done but showing how it has been done.

Thanks were expressed for the time and energy expended by the judges, and also to R. W. Darrow of the Glenn L. Martin Co., chairman of the Awards Administrative Committee, to Blaine G. Wiley, executive secretary of N.I.A.A., and to W. R. Northlich of the Farson, Huff & Northlich Agency who organized the panel of judges and carried the project through to its successful conclusion.

MODULAR COORDINATION

advisory committee formed by HHFA to speed wide-spread adoption of system.

An industry advisory committee has been formed by the Housing and Home Finance Agency to assist the development of the program of research on modular coordination in housing construction now going forward under the supervision of the HHFA's Division of Housing Research. This research aims at the added efficiency and economies attainable through adoption of a standard unit of measurement in housing materials and housing design.

• **GUIDE.**—In announcing formation of the Advisory Committee on Modular Coordination, Administrator Raymond M. Foley of the HHFA said that its advice would be sought first on work under way which includes a project aimed at the development of "A Guide for the Dimensional Standardization of Building Elements and Components Based on the Four-Inch Module." This project will be handled for the HHFA under contract by the Illinois Institute of Technology, Chicago, Ill.

Research leading to more general understanding and acceptance of methods of modular coordination, as a means of conserving time, labor and materials and reducing construction costs, is part of the HHFA's broad program of housing research, now putting main emphasis on problems related to national defense.

• **MEETING.**—First meeting of the new committee was held May 23 in Washington, D. C., under the chairmanship of Dr. Richard U. Ratcliff, director of HHFA's Division of Housing Research.

Members of the committee are:

Prof. John E. Burchard, Dean of Humanities, Massachusetts Institute of Technology, Cambridge, Mass.

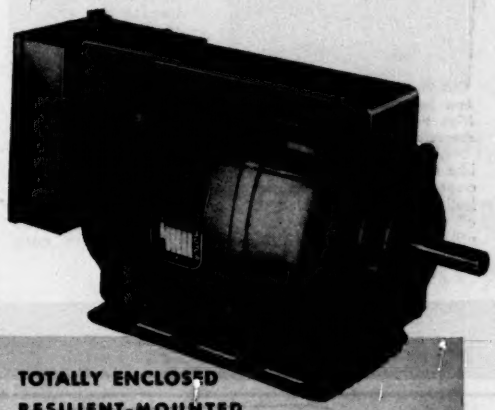
William Demarest, Jr., Secretary for Modular Coordination, American Institute of Architects, Washington, D. C.

Carl B. Lans, Technical Director, National Association of Home Builders, Washington, D. C.

Knud Londberg-Holm, Editor-in-Chief, Sweet's Catalog Service, New York, N. Y.

BALDOR 4-Purpose Motor

for fan, blower and unit heater applications



TOTALLY ENCLOSED
RESILIENT-MOUNTED
BALL-BEARING, NEMA DIMENSIONS

BALDOR 4-purpose Motor for fan, blower and unit heater applications have these IMPORTANT FEATURES:

Constant speed:	115 volt
Two-speed:	115 volt
Constant speed:	230 volt
Two-speed:	230 volt

. . . quiet, vibrationless operation. Resilient Gimbal-mounted. Rubber-mounted knock-out box, insulated from motor frame, prevents transmission of noise and vibration.

. . . metal strap over motor prevents motor from springing out of cradle mounting rings.

. . . motor operates with shaft either vertical or horizontal.

BALDOR ELECTRIC CO. • ST. LOUIS

Baldor

BETTER

AGITAIR® METER

For Accurate Measurement of Air Velocity and Air Pressure

Low Velocity Range: 0-750 fpm
High Velocity Range: 750-4000 fpm
Pressure Range: 0-4 inches water

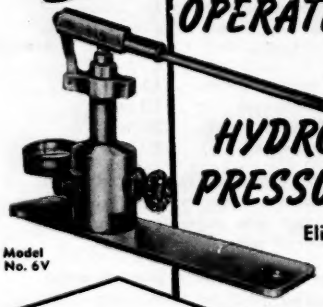
Based on the hot thermopile principle, the AGITAIR Meter gives instantaneous accurate measurements of air velocities as low as 5 fpm, and as high as 4000 fpm. It is inherently stable, does not waver or jerk and unlike many resistance type hot-wire instruments it is free from errors caused by temperature variations, radiation effects and lead resistance. For taking static pressure readings from 0 to 4" wg, a special attachment is provided. The simplicity and utility of the AGITAIR Meter make it useful for many diverse applications.

Write for Bulletin AM-100

AIR DEVICES Inc.
17 East 42nd Street New York 17, N. Y.
Air Diffusers • Air Filters • Exhausters

NEW

MANUALLY OPERATED PUMP for HYDROSTATIC PRESSURE TEST



Model No. 6V

Eliminates Involved Mechanical Apparatus

INEXPENSIVE EFFICIENT EASILY OPERATED

Learn how you can save on initial investment, reduce maintenance, eliminate power costs... MAIL THIS COUPON.

CAPITOL Hydrostatic Test Pump

Easy strokes pump 5 times the volume of water to 1000 lb. test pressures. Compact. Lightweight.

WRITE for Illustrated Data!

CAPITOL MACHINE WORKS • DEPT. C •
424 7th ST. • OAKLAND, CALIF.

Your name.....
Firm name.....
Address.....
City..... State.....
Our average test pressures are.....

William H. Scheick, Executive Director, Building Research Advisory Board, Washington, D. C.

Robert B. Taylor, Director of Research, Structural Clay Products Research Foundation, Chicago, Ill.

FOUNDRY SOCIETY

plans national technical center.

The American Foundrymen's Society, international technical society of the metal castings industry, announced today through its president, Walton L. Woody of National Malleable and Steel Castings Co., Cleveland, a program to found a technical center for the producers of cast metals vital to the nation's rearmament program. Over $95,000 of a $100,000 goal has been raised by voluntary subscription from the Society's 9,500 members, and the center is to be established during the next two years in one of the principal Midwestern foundry centers.

• **NEED.**—The need for a technical foundry center has been demonstrated during two World Wars, according to Mr. Woody, during which the importance of cast metals to rearmament has been shown by the enormous requirements of the armed forces. Cast armor and steel castings are required for mobile equipment and artillery; gray cast iron for engines, transmissions, etc., for mobile ordnance; malleable cast iron for truck and small arms components; cast aluminum and magnesium for aircraft engines and many vital parts. In addition, naval craft require huge steel castings for sternposts, anchors, chain and many other component parts, as well as large quantities of brass and bronze castings for valves, pumps and other non-corrosive applications in all ships and submarines.

• **LOCATION.**—Headquarters for the society, since 1896 the technical society for the metal castings industry, have been located in Chicago since 1916. Selection of a site for a permanent headquarters and technical center will be made by a special housing committee of foundry executives.

In 1917, at the request of Newton D. Baker, then Secretary of War, the society established a war service committee for the American foundry industry which served throughout World War I. During the second World War, the organization maintained a constant flow of information to foundries engaged in the production of cast metal parts for the military forces.

• Sale of the largest gas turbine-generator yet ordered for the commercial generation of electric power was announced recently by D. W. R. Morgan, vice president of the Westinghouse Electric Corporation at South Philadelphia, Pa. The unit, a 15,000-kilowatt machine, will be installed in the Bartlesville area of the Public Service Company of Oklahoma. Natural gas from the Oklahoma fields will provide the heat energy the new turbine will convert into electrical power. It is scheduled for delivery from the Westinghouse Steam Division in about three years.

• L. J. Wing Mfg. Co., Linden, N. J., manufacturers of heating, ventilating and combustion equipment, announce the appointment of Frank Story as advertising and sales promotion manager, with the title of publicity manager. Mr. Story has been in sales and advertising for many years, specializing in the machinery field, with Earle Gear and Machine Co., Watson-Flagg Machine Co., and more recently was with the publication *Metal Working*.

• The Brass Mill Industry Advisory Committee, meeting May 15 with officials of the National Production Authority, U. S. Department of Commerce, reported the industry's inventory of melting copper, refinery shapes, brass scrap, and zinc as 37 to 64% lower than on January 1. One industry representative said his mill never has more than seven days' supply.

• In line with the policy of the company to build its official family from the ranks, both Melvin A. Jackson and Robert W. Weaver have been elected to the office of vice president of Grant Wilson, Inc.

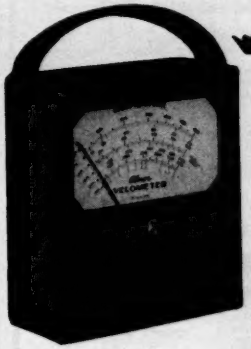
• Burchard E. Horne, of Andover, Mass., president and treasurer of the Watts Regulator Co., Lawrence, Mass., passed away suddenly on Monday, May 28th, while on a fishing trip in Canada. Mr. Horne was born in Lawrence, Mass., Jan. 6, 1887. Upon completion of his education, he became associated with his father in the Geo. W. Horne Roofing Co. In 1918, he and two associates purchased the interests of Watts Regulator Co. Mr. Horne procured, in 1923, the entire interests of the company and successfully set up its policies and directed its activities.

• The National Association of Fan Manufacturers, in meeting at General Brock Hotel, Niagara Falls, Canada. on June 6, elected as president for the ensuing year, John M. Frank, president of the Ilg Electric Ventilating Co., Chicago, Illinois.

• The Air Conditioning and Refrigerating Machinery Association has elected as its new president Fred W. Smith, president of the Baker Refrigeration Corp. of South Windham, Maine. Elected as ACRMA vice presidents were C. S. Stackpole, vice president and general sales manager of Airtemp Division, Chrysler Corp., Dayton, Ohio, and H. B. Donley, manager of marketing, General Electric Co., Bloomfield, New Jersey. G. A. Heuser, president, Henry Vogt Machine Co., Louisville, Kentucky, was reelected ACRMA treasurer.

• May's construction contract awards reached by far the highest total of any month in history in the 37 states east of the Rockies, it was stated by F. W. Dodge Corp., construction news and marketing specialists. This almost automatically means a new high for the 48 states, according to Dodge, because the May figure of $2.6 billion was so far above the previous high of last August's $1.5 billion.

Alnor Velometer



gives instant, direct reading of Air Velocity . . . Anywhere!

Here is a precision-built, self-contained, portable instrument that gives instant, accurate reading of air velocities—anywhere. Measures speed of flow through ducts, grilles, motors, furnaces, etc., or in the open. Needs no calculations or reference charts. Anyone can use it and get accurate measurements. Available in a wide range of scales, and with a wide assortment of jets and fittings if needed. You'll want full details and prices, so write for Bulletin No. 2448-G. Illinois Testing Laboratories, Inc., Room 514, 420 N. La Salle Street, Chicago 10, Ill.

Alnor

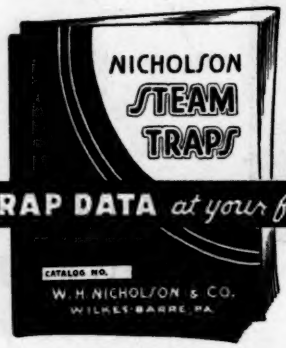
PRECISION INSTRUMENTS FOR EVERY INDUSTRY

Send for Nicholson

TRAP CATALOG 250

A Standard Reference on Traps for All Applications

Newly revised, this 32-page reference describes traps for all mediums and pressures: thermostatic and metal expansion for pressures to 225 lbs.; weight and piston - operated for heavy duty. Complete with installation diagrams and formulae for determining proper size trap.



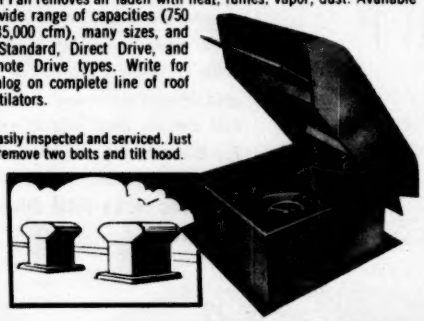
W. H. NICHOLSON & CO. 199 OREGON ST. WILKES-BARRE, PA.

Sales and Engineering Offices in 53 Principal Cities.

Architecturally Right for Any Building

Allen High-Efficiency ROOF FAN

Here's why the Allen-engineered, power-driven Roof Fan is specified consistently for various commercial and industrial buildings: it is low in initial cost; it is easy to install; and because of its lower overall height, this fan fits smoothly onto any rooftop, without disrupting the architectural lines of the building. This rugged, High-Efficiency Roof Fan removes air laden with heat, fumes, vapor, dust. Available in wide range of capacities (750 to 45,000 cfm), many sizes, and in Standard, Direct Drive, and Remote Drive types. Write for catalog on complete line of roof ventilators.



Easily inspected and serviced. Just remove two bolts and tilt hood.

Representatives in principal cities are listed in our catalog in Sweet's Architectural File, Section 20b.

ALLEN INDUSTRIES VENTILATION

PRODUCTION PLANNING CO.
ROCHESTER, MICHIGAN

Roof Ventilators for Every Commercial and Industrial Need

Abstracts and Reviews

(Continued from page 94)

the technical advances that have been made in this field.

The association, through its committees, has been engaged for five years in assembling the various chapters, each of which had to be checked and approved by a special group. As a result, the information is considered to be representative of best practices in the industry and to present sound engineering and commercial information.

Included in the 15 chapters are those covering the economics of district heating, district heating plants, water chemistry and corrosion, steam distribution, metering, building heating systems, consumers' process equipment, consumers' accessory equipment, estimating steam requirements, economical use of steam, rates, hot water for district heating, and sales activities.

Included in the book is a product directory of equipment used in district heating.

District Heating Handbook. Cloth bound, 6 x 9 inches, 529 pages. Published by National District Heating Association, 827 N. Euclid Ave., Pittsburgh 6, Pa. Price, $7.

ENGINEERING THERMODYNAMICS

There is certainly no shortage of books on thermodynamics and therefore the announcement of another book on this general subject normally would create no unusual interest. However, in Engineering Thermodynamics, Dr. Herman J. Stoever, professor of mechanical engineering, Iowa State College, has made a fresh division and arrangement of his subject matter.

The text is divided into three main divisions—Part 1 is devoted to the development of the first law of thermodynamics; Part 2, concepts of the second law of thermodynamics; and in Part 3, the principles and methods treated in the other sections are applied to the analysis of some of the more important kinds of heat power equipment. Included in this division are chapters on steam power plants, internal combustion engines, refrigeration, compressors, nozzles and turbines, meters and pitot tubes, and air conditioning.

The author, in his 15 years' experience teaching thermodynamics, found that the solution of problems was an effective tool to help in the better understanding of the text. Therefore, at the end of more than half of the chapters of the book there are graded problems, with answers to most of them. The book is designed for use in a one-year undergraduate course.

Engineering Thermodynamics, by H. J. Stoever. Cloth bound, 6 x 9 inches, 458 pages. Published by John Wiley & Sons, Inc., 440 4th Ave., New York 16, N. Y. Price, $5.75.

• • •

METHODS OF ANALYZING COAL AND COKE—First published in 1912, this bulletin on methods of analyzing coal and coke has been revised several times and the latest edition has just been published. The new edition describes in detail methods employed in the Bureau of Mines Laboratories for analyzing coal and coke and

it represents the accumulated knowledge of more than 40 years work in this field. Bulletin 492, Superintendent of Documents, Government Printing Office, Washington 25, D. C. Price, 50 cents.

MANUAL ON BOILER WATER TREATMENT—The Bureau of Mines has prepared a boiler water treatment manual for federal plant operators, which is designed to be a companion book to Bureau of Mines Handbook No. 3 on questions and answers on boiler feedwater conditioning. This manual was prepared by Lcuis Goldman, supervising chemist of the Bureau's Boiler Water Service Section. After covering two methods of boiler water treatment, information is given on corrosion prevention and corrosion control. Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Price, 30 cents.

AIR POLLUTION CONTROL.—A technical and administrative report on air pollution control in Los Angeles County, California, describes the problems that were presented at the time controls started, the damage that air pollution effected on individual groups, etc., and the functions of the engineering division to deal with this problem. These functions include processing of applications for permits to construct and to operate new basic air control equipment, conducting of investigations to determine the air contaminants and to advise that industry on possible methods for the solving of special air pollution problems. Report of 49 pages contains some interesting charts and data. Air Pollution Control District, County of Los Angeles, Los Angeles, Calif.

ARMSTRONG COUNTY COALS—Report of Investigations No. 4788 on Preparation Characteristics of Coal Occurring in Armstrong County, Pa., indicate that 60% of the county's production can be upgraded to metallurgical standards. This report is the third in the program which aims to make a county-by-county study of known coking coal reserves. Complete float-and-sink data are given on 13 mine-run tipple samples. Bureau of Mines, Publication Distribution Section, 4800 Forbes St., Pittsburgh 13, Pa.

VENTILATION AND OPERATION OF OPEN SURFACE TANKS — The American Standard Safety Code, for ventilation and operation of open surface tanks, has just been approved and published by the American Standards Association. It is marked Z9.1-1951. Work on this code was sponsored by the American Industrial Hygiene Association, American Society of Heating and Ventilating Engineers, and the National Association of Fan Manufacturers. The safety of the operator is the primary concern of the various provisions of this standard. Included are rules on personal protection, operation, inspection, maintenance, and installation and special precautions for special material. American Standards Association Inc., 70 East 45th St., New York 17, N. Y. Price, 75 cents.

ADSCO
STRAINERS & SEPARATORS

Prevent Expensive Repairs and Avoid Shutdowns

Stop trouble before it starts.
Install ADSCO Strainers and Separators... keep operating equipment running at top efficiency

ADSCO Y and T-Type STRAINERS keep dirt and scale out of your equipment. Installed ahead of every regulator, pump, valve or trap, ADSCO Strainers will reduce maintenance and prevent costly shutdowns. Designed with tapered seating of screen and gasketed cap. Pressure drop no greater than through ordinary elbow. Sizes from ¼" to 6". For 9 to 1 screen ratio, and extra large pocket for sediment collection, use the ADSCO T-Type.

ADSCO SUCTION STRAINERS are used on lines carrying oil, water or other liquid. Usually installed on the suction side of pumps and other apparatus, they can be used on discharge or other service. Solids collect in large basket screen, easily removed for cleaning. Quick opening cover. Straight-through or offset connections in sizes from 2" to 10", for various pressures up to 300 psi.

ADSCO SEPARATORS remove moisture, oil and small solid matter from steam, air and gas lines. Deliver dry steam to equipment for increased efficiency. Available in vertical or horizontal types in sizes up to 10".

ADSCO RECEIVER SEPARATORS are recommended for use in steam lines to provide ample capacity for water or oil and to eliminate pulsation from reciprocating equipment. Deliver steam at uniform pressure, separate slugs of water and oil. Optional piping connections. Large range of capacities. Sizes from 1½" to 12", 150 psi and 300 psi, and for temperatures to 650 F.

← SEND FOR NEW, REVISED COMPREHENSIVE BULLETIN

Completely revised 16-page catalog of the entire line of strainers and separators. Contains selection data, descriptions, dimensions, weights and list prices. *Write for* Bulletin V-46-50A.

AMERICAN DISTRICT STEAM CO., INC. • North Tonawanda, N.Y.

AIR-FLO
AUTOMATIC
CEILING SHUTTER
FOR ATTIC FAN
Built so they can be installed practically flush with the ceiling, AIR-FLO Ceiling Shutters present a refined, finished appearance. Their natural aluminum color blends with any decoration; eliminating need for painting, and no grille or winter cover is required. Furnished in 5 different widths, single panel up to 73" long. No operating mechanism shows. Built-in fusible link. Meets fire underwriters' requirements.
WRITE FOR NEW CATALOG 43-F
Illustrations and details of the complete AIR-FLO line
AIR CONDITIONING PRODUCTS CO.
2340 W. LAFAYETTE BLVD. • DETROIT 16, MICH.

EFFICIENT, LOW COST AIR REMOVER
Muckle VENTS
POWER DRIVEN ROOF EXHAUSTER
For stores, cafes, bakeries, laundries, garages, etc. Built to function in wet air—motor is out of line of air flow. A compact, sturdy, easy-to-install package unit. Sizes 370 to 13,080 C.F.M. air delivery. Fits any roof. Write us about YOUR problem.
MUCKLE MANUFACTURING CO. • OWATONNA 3, MINN.

NEWS BRIEFS

• Mueller Brass Co., Port Huron, Mich., has announced the appointment of Robert L. Gibbs as manager of sales personnel of the organization effective immediately. Mr. Gibbs, who has been with the company for the past ten years, was formerly head of the sales promotion and advertising division. Also made known was the appointment of E. A. Fairchild as manager of sales promotion and advertising, succeeding Mr. Gibbs. Prior to being named to his new position, Mr. Fairchild served as account executive with the Price, Hedrick & Tanner advertising agency of Saginaw, Mich.

• H. Blake Thomas, vice president in charge of sales, McQuay, Inc., Minneapolis, manufacturers of heating, refrigeration and air conditioning equipment, has been elected to the board of directors. Mr. Thomas' association with the company dates back to 1930. He served successively as assistant sales manager and general sales manager before his appointment as vice president, January 1, 1948.

• Cooling Tower Institute announces the appointment of W. A. Shoudy, consulting engineer of New York City, as executive manager.

• All companies using copper or copper-base alloy materials in their industrial operations will be required to file a series of monthly reports of their operations beginning with April, it was announced by the National Production Authority, U. S. Department of Commerce. Regular monthly reports will be required thereafter.

• J. Phillips Cosgrove has been elected executive vice president of American Radiator & Standard Sanitary Corp. Prior to his election to the newly created post, Mr. Cosgrove had been serving as vice president of European divisions. In that position he was in charge of the corporation's foreign operations.

Getting Personal

J. Partington, Jr.

James Partington, Jr., *(How to Make a Survey for Air Conditioning and Refrigeration Applications,* page 65) is Supervisor of Industrial Sales in the Air Conditioning Division of General Electric Company at Bloomfield, N. J. He has been connected with G.E. since 1930 and with the Air Conditioning Division since its founding in 1932. He attended Newark Academy, Newark, N. J., and graduated from Haverford College, Haverford, Pa.

Mr. Partington has had extensive practical experience as service engineer, application engineer and sales engineer during his many years in the air

conditioning business. During World War II his time was devoted to special applications for the Armed Services, including such projects as refrigerated barges and mobile power generating trains. At present, he is working on defense applications of low temperature refrigeration, as well as industrial air conditioning.

He is the author of several articles on industrial applications which have appeared in HEATING AND VENTILATING—the first one published in 1944.

Gayle B. Priester *(Check Data for Air Conditioning and Ventilating Design*, page 74) was born and obtained his early schooling in Minneapolis, Minn. He received the degree B.M.E. with distinction in 1933 from the University of Minnesota and was awarded a scholarship to Harvard University where he was granted the degree M.S. in Industrial Hygiene in 1934. He went to work for Carrier Corp. in 1935 and served for six years as an application and sales engineer in air conditioning in New York City and Chicago.

Mr. Priester then went to Cleveland to teach in the Mechanical Engineering Department at Case Institute of Technology and to do testing and consulting work. He received the professional degree M.E. from Case in 1943. In 1946 he resigned as associate professor to take his present position of air conditioning engineer, Consolidated Gas Electric Light and Power Company of Baltimore.

He is a past president of the Northern Ohio and the Baltimore chapters of the ASHVE, active in the ASRE, a registered professional engineer, co-author of the college text and reference book *Refrigeration and Air Conditioning*, and author of other publications.

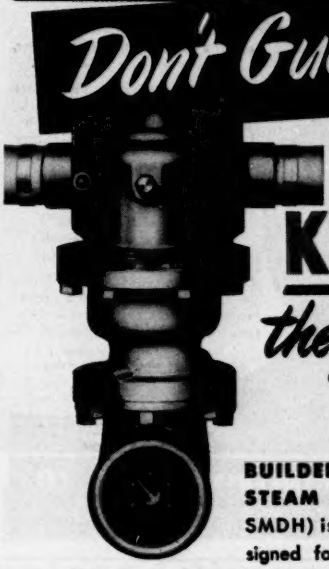
Lewis Smith *(To Zone or Not to Zone*, page 81) has been for the past twenty years with the C. A. Dunham Company in New York. His work has kept him closely associated with heating of large-scale housing projects, public and private, especially those involving the use of the Dunham Metro method of piping. Introduced zone control into Japan and China prior to World War II. He represented his company in Washington during that war and served for a time as chief of the heating section of the War Production Board. Before joining the Dunham Company, he was engaged in power plant construction and operation in this country and Brazil. He has contributed a number of articles on heating to technical magazines.

L. Smith

INDUSTRIAL DEGREE-DAYS
May, 1951

City	55F Base	45F Base
Baltimore, Md.	0	0
Buffalo, N. Y.	56	0
Chicago, Ill.	(a)	(a)
Cleveland, Ohio	21	0
Detroit, Mich.	40	0
Indianapolis, Ind.	12	0
New York, N. Y.	2	0
Philadelphia, Pa.	0	0
Pittsburgh, Pa.	3	0
St. Louis, Mo.	4	0

Don't Guess...

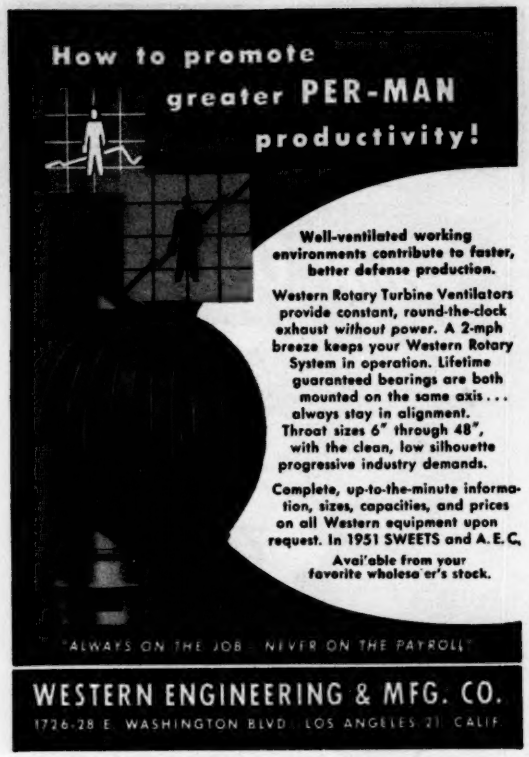


KNOW
the pounds

BUILDERS SHUNTFLO STEAM METER (Model SMDH) is especially designed for district heating companies, apartment houses, hotels, and commercial buildings for metering steam consumption in 1" and 1½" lines. Compact, easy to install, accurate—Model SMDH "rings up" the steam pound-by-pound with watch-dog dependability. Shuntflo is self-contained and self-operated. The steam flowing through the pipeline drives the direct-reading totalizer, providing information on steam consumption that's accurate within ±2% under most conditions. Model SMDH is available with threaded or flanged ends for 1" lines — with flanged ends for 1½" lines. Also available is Model SMKS for 2" to 14" lines. For Bulletins 400-F1 and 400-F2, the complete story on Builders Shuntflo Meters, address Builders-Providence, Inc., (Division of Builders Iron Foundry), 469 Harris Ave., Providence 1, R. I.

BUILDERS makes a complete line of flow meters and controllers for liquids, steam, air, gas, and dry materials . . . mechanical and differential . . . including The Venturi Meter and Chlorinizers (chlorine gas feeders).

BUILDERS PROVIDENCE
Instruments

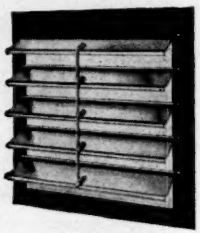

How to promote
greater PER-MAN
productivity!
Well-ventilated working environments contribute to faster, better defense production.
Western Rotary Turbine Ventilators provide constant, round-the-clock exhaust without power. A 2-mph breeze keeps your Western Rotary System in operation. Lifetime guaranteed bearings are both mounted on the same axis . . . always stay in alignment. Throat sizes 6" through 48", with the clean, low silhouette progressive industry demands.
Complete, up-to-the-minute information, sizes, capacities, and prices on all Western equipment upon request. In 1951 SWEETS and A. E. C.
Available from your favorite wholesaler's stock.
"ALWAYS ON THE JOB . . . NEVER ON THE PAYROLL"
WESTERN ENGINEERING & MFG. CO.
1726-28 E. WASHINGTON BLVD. . LOS ANGELES 21, CALIF.

Elgo Ventilating Specialties

You Can't Beat This Automatic Shutter

An automatic shutter that not only opens more quickly but also closes more tightly. Completely weatherstripped to make a snug, tight fit. And its louvers have special felt silencing pads. Noted also for absence of blade flutter. Sizes from 8" to 72" square — also rectangular.

WRITE FOR CIRCULAR AND PRICES



"ELGO" TYPE AUTOMATIC SHUTTER
Front View (Open)

Free CATALOG

ELGO SHUTTER & MANUFACTURING CO.
2738 W. Warren Detroit 8, Mich.

An Authoritative Reference Book *for*

Heating Engineers—Estimators—Air Conditioning Engineers — Ventilating Engineers — Architects—Piping Engineers—Contractors—Plant Engineers—Operating and Maintenance Engineers

HEATING AND VENTILATING'S

ENGINEERING DATABOOK

Write for Descriptive Folder to
HEATING AND VENTILATING, 148 Lafayette St., N. Y. 13

COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available.

REFRIGERATION CONGRESS—Eighth International Congress of Refrigeration, under the auspices of The International Institute of Refrigeration, to be held at the Church House, Westminster, London, Eng. The Secretary, Dalmeny House, Monument St., London, E. C. 3, Eng.....**AUGUST 29—SEPTEMBER 11, 1951.**

ENGINEERING EXHIBITION—The Engineering, Marine and Welding Exhibition, sponsored chiefly by The British Engineers' Association, Inc., to be held in London, England. A. W. Berry, director of the Association, 32 Victoria St., London, S. W. 1, England. ..... **AUGUST 30—SEPTEMBER 13, 1951.**

INSTRUMENT CONFERENCE AND EXHIBIT—1951 Instrument conference and national exhibit of the Instrument Society of America, at the Coliseum, Houston, Tex. John McCaffery, assistant executive secretary of the Society, 921 Ridge Ave., Pittsburgh 12, Pa. .....**SEPTEMBER 10-14, 1951.**

ASME MEETING—Fall meeting of the American Society of Mechanical Engineers, at the Radisson Hotel, Minneapolis, Minn. C. E. Davies, secretary of the Society, 29 West 39th St., New York 18, N. Y. .....**SEPTEMBER 25-28, 1951.**

PLUMBING AND HEATING MEETING—Annual meeting of the Plumbing and Heating Industries Bureau, at Palmer House, Chicago, Illinois. Norman J. Radder, secretary of the Bureau, 35 East Wacker Drive, Chicago 1, Illinois. **OCTOBER 11, 1951.**

AGA CONVENTION—33rd annual convention of the American Gas Association, at Kiel Auditorium, St. Louis, Mo. Secretary of the Association, 420 Lexington Avenue, New York 17, N. Y. .....**OCTOBER 15-17, 1951.**

PUBLIC HEALTH MEETING — 79th annual meeting of the American Public Health Association, at Civic Auditorium, San Francisco, Calif. Willimina Rayne Walsh, associate secretary of the Association, 1790 Broadway, New York 19, N. Y. .....**OCTOBER 29—NOVEMBER 2, 1951.**

REFRIGERATION SHOW—7th All-Industry Refrigeration and Air Conditioning Exposition, at Navy Pier, Chicago, Ill. Show director, REMA 1346 Connecticut Ave., N.W., Washington, D. C. .....**NOVEMBER 5-8, 1951.**

ASME MEETING—Annual meeting of the American Society of Mechanical Engineers, at Chalfonte-Haddon Hall, Atlantic City, N. J. C. E. Davies, secretary of the Society, 29 West 39th St., New York, N. Y. .....**NOVEMBER 25-30, 1951.**

CHEMICAL ENGINEERS MEETING—Annual meeting of the American Institute of Chemical Engineers, at Chalfonte-Haddon Hall, Atlantic City, N. J. Secretary of the Institute, 29 West 39th St., New York 18, N. Y. .....**DECEMBER 2-5, 1951.**

HEATING WHOLESALERS' MEETING—Annual meeting of the National Heating Wholesalers' Association, at the Hotel Statler, Cleveland, Ohio. E. L. Wyman, executive secretary, 609 Commerce Building, Cleveland. .....**DECEMBER 3-4, 1951.**

WARM AIR CONVENTION—38th annual convention of the National Warm Air Heating and Air Conditioning Association, at Hotel Cleveland, Cleveland, Ohio. George Boeddener, managing director, 145 Public Square, Cleveland. .....**DECEMBER 5-6, 1951.**

AUTOMOTIVE ENGINEERS MEETING — Annual meeting of the Society of Automotive Engineers, Inc., at the Hotel Book-Cadillac, Detroit, Mich. John A. C. Warner, secretary of the Society, 29 West 39th St., New York 18, N. Y. ..... **JANUARY 14-18, 1952.**

ELECTRIC ENGINEERING MEETING—Winter general meeting of the American Institute of Electrical Engineers, at the Hotel Statler, New York, N. Y. Secretary of the Institute, 33 West 39th St., New York 18, N. Y.....**JANUARY 21-25, 1952.**

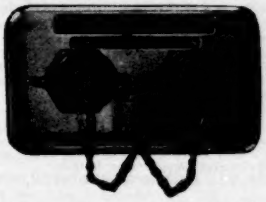
SPECIFY:

ALLENCO

First in Interior Fire-Protection Equipment

CONCEALED or FLUSH *type* SIAMESE

This Siamese minimizes projections from face of building. Body, with two independent self-closing clapper valves, can be inside or even built into wall. Extra heavy bronze, lasts for life of building. Siamese (inlet for F. D.) or wall hydrant (outlet for F. D.), with or without sill cock, full range of sizes. Complete line of standpipe equipment.



Whatever your wants in interior fire-protection equipment, you'll find ALLENCO provides the most *reliable* and economical product. See Sweet's Architectural Catalog File.

A. I. A. 29e2

ARCHITECT'S DATA BOOK— Allen on Interior Fire-Protection—packed with concise and complete specifications and practical working data to make your work easier. Available without cost to architects and engineers. Write for your copy or for a call by our Consulting Service . . . now.

Established 1887

W. D. ALLEN

Manufacturing Co.

CHICAGO 6 NEW YORK 7

Rigid KENNEDY Inspection Guarantees Fittings Free of Leaks, Burrs and Scales

KENNEDY MALLEABLE-IRON screwed fittings are made with tough, close-grained iron, tested to 43,000 psi. Carefully controlled annealing prevents splitting or cracking under almost any distortion forces. Uniform hot-dip galvanizing assures a heavy coating that will not chip or flake. Precision machining provides exact alignment . . . speeds installation time.

KENNEDY CAST-IRON screwed and flanged fittings, are made with tough, close-grained metal *more than* 50% *stronger* than ordinary gray iron. Precision threading and accurately machined flanges help you get strong, tight joints easily. The complete Kennedy line also includes cast-iron sprinkler and drainage fittings, and cast-iron flanges.

KENNEDY BRONZE fittings with tensile strength of 34,000 psi are individually tested to 100 lbs. air pressure under water to insure freedom from leaks. Available rough or polished in all standard types and sizes.

WRITE FOR BULLETIN 104

Est. 1877

THE **KENNEDY**

VALVE MFG. CO. • ELMIRA, N.Y.

VALVES • PIPE FITTINGS • FIRE HYDRANTS

This fellow needs DRIVE-IT!

-and SO DO YOU for fastening steel or wood to concrete or steel...

Pity the man who is still using old-fashioned "dig and drill" methods for fastening steel or wood to concrete. He's wasting *his* time and *your* money.

DRIVE-IT powder-powered tools were designed especially to do such fastening jobs in a split-second—and at a great saving in time and money.

Now, especially, with help becoming harder to get, it will pay you to investigate the DRIVE-IT method of fastening. There's a tool for light work and one for heavy work—each approved by the Underwriters' Laboratories.

For the whole story on DRIVE-IT call your DRIVE-IT representative—or write us direct.

Distributors from Coast to Coast

THE POWDER POWER TOOL CORPORATION

0719 S. W. Woods Street, Portland 1, Oregon
Cleveland Branch: 2075 E. 65th St., Cleveland, Ohio
Canadian Distributor: Ammo Power Tool Co., Ltd., Vancouver, B. C.

APPROVED BY UNDERWRITERS' LABORATORIES

CLASSIFIED ADVERTISING

Non-display advertisements 15 cents a word per insertion. (No charge for name and address.) Minimum charge $5.00. Payable in advance.

ESTIMATING SERVICE

Any Trade and Type of Project
Literature and Sample on request
CONSTRUCTION SURVEY COOPERATIVE
101 Park Ave., New York 17, N. Y.
MUrray Hill 5-3717 Founded 1922

WANTED — SALESMEN, JOBBERS or DEALERS to sell nationally known fuel oil treatment — DACAROL. Many select areas available. Product backed by advertising and years of actual usage. Large potential can be derived through the sale of DACAROL. Write Dacar Chemical Products Company, Pittsburgh 20, Pennsylvania.

WANTED — ADVERTISING and PROMOTION EXECUTIVE — Unusual opportunity with a leading manufacturer for a man under 35 with radiator heating sales promotion experience. Send confidential resume to Box No. 729, HEATING and VENTILATING, 148 Lafayette Street, New York 13, N. Y.

"THE E. L. BRUCE CO. WAY"
Floor maintenance products for industrial-institutional-commercial trade. Joseph A. Farrell, 687 Concord Avenue, Cambridge 38, Mass. Tel. K17-1049. Descriptive literature upon request. Brushes-Paints-Sundries.

FOR SALE — ONE OIL BURNING DRAVO UNIT HEATER, MODEL 75. Has been used one heating season. Good heating system for warehouse or garage space. Is in first class condition and can be inspected at THE AMERICAN NEWS COMPANY, 1 Nepperhan Avenue, Elmsford, New York.

FOR SALE—A new, modern, complete sheet metal shop in Southern vicinity. Widow desires to sell due to poor health. Box No. 728, HEATING and VENTILATING, 148 Lafayette Street, New York 13, N. Y.

FOR SALE—1 BRYANT DEHUMIDIFIER, size 148, B.T.U. Output 148,000, and O.F.M. Capacity 1,800. Write Box 2087, Tampa, Florida.

ALL-WEATHER ALUMINUM HOLDERS
All sizes for truck meter tickets. Keep drivers' tickets clean. Send sample of your ticket and we will furnish proper size holder. DEGREE-DAY SYSTEMS, WOODSIDE, N. Y.

An Authoritative Reference Book

for

Heating Engineers
Estimators
Air Conditioning Engineers
Ventilating Engineers
Architects
Piping Engineers
Contractors
Plant Engineers
Operating and Maintenance Engineers

HEATING AND VENTILATING'S
ENGINEERING DATABOOK
Write for Descriptive Folder

ALPHABETICAL INDEX OF ADVERTISERS

A

Acme Industries, Inc. 52
Aerofin Corporation ..... *
Ahlberg Bearing Co. ..... *
Air Conditioning Products Co. 120
Air Devices, Inc. 116
Air Filter Corp. 111
Air-Maze Corp. ..... *
Alco Valve Co. 29
Allen-Bradley Co. ..... *
Allen Ventilator Div., Production Planning Co. 118
Allen, W. D., Manufacturing Co. 123
American Air Filter Co., Inc., Insert bet. 16-19
American Blower Corp. ..... Insert 17
American District Steam Co., Inc. .. 119
American Radiator & Standard Sanitary Corp. ..... *
American Ventilating Hose Co. ..... *
Ames Iron Works ..... *
Anderson, V. D., Co. ..... *
Anemostat Corp. of America ..... *
Arabol Manufacturing Co. ..... *
Armstrong Machine Works ..... *
Auer Register Co. 120

B

Baldor Electric Co. 115
Barber-Colman Co. ..... *
Bell & Gossett Co. ..... *
Binks Manufacturing Co. 109
Bishop & Babcock Mfg. Co. ..... *
Breidert, G. C., Co. ..... *
Brunner Manufacturing Co. 31
Bryant Heater Div. Affiliated Gas Equipment, Inc. ..... *
Buffalo Forge Co. 8-9
Builders-Providence, Inc. 121
Bundy Tubing Co. 27
Bush Manufacturing Co. 43
Byers, A. M., Co. 54

C

Capitol Machine Works 116
Carrier Corp. 48
Chase Brass & Copper Co. 44
Chelsea Fan & Blower Co., Inc. ..... *
Chicago Pump Co. 16
Clarage Fan Co. ..... *
Classified Advertisements 124
Cleaver-Brooks Co. 19
Committee on Steel Pipe Research.. 34
Connor, W. B., Engineering Corp. 15-45
Crane Co. 1
Curtis Refrigerating Machine Div. of Curtis Mfg. Co. 28

D

Davis Engineering Corp. 107
Dollinger Corp. ..... *
Dravo Corporation 24

E

Elgo Shutter & Mfg. Co. 122
Ellison Draft Gage Co. 109
Emerson Electric Manufacturing Co. 30

F

Farr Company 10
Fedders-Quigan Corp. 22-23
Fluid Systems, Inc. 4-5-49

G

General Electric Co. 51
Grant Wilson, Inc. 111
Grinnell Co., Inc. .....Inside Front Cover
Gustin-Bacon Mfg. Co. 25

H

Harrington & King Perforating Co.... 111
Henry Valve Co. .....Inside Back Cover
Hoffman Specialty Co. ..... *

I

Illinois Engineering Co. ..... *
Illinois Testing Laboratories, Inc. .. 117
Industrial Press ..... *
Industrial Sound Control, Inc. ..... *
Infra Insulation, Inc. 57
Iron Fireman Manufacturing Co..... 18

J

Jenkins Bros. ..... *
Johnson Service Co. ..... *
Joy Manufacturing Co. ..... *

K

Kennard Corporation ..... *
Kennedy Valve Mfg. Co. 123

L

Ladish Co. ..... *

M

Marley Company, Inc. 40
Marlo Coil Co. ..... *
Marsh Heating Equipment Co. 46
Massachusetts Blower Div., Bishop & Babcock Mfg. Co. ..... *
McCord Corporation ..... *
McDonnell & Miller, Inc. .... Back Cover
Mercoid Corporation 107
Minneapolis-Honeywell Regulator Co. 58-59
Modine Manufacturing Co. 105
Mt. Hawley Mfg. Co. ..... *
Muckle Mfg. Co. 120
Mueller Brass Co. 2

N

Nash Engineering Co. 60
National Tube Co. ..... *
New York Blower Co. 41
Niagara Blower Co. 114
Nicholson, W. H., & Co. 118
Norman Products Co. 39

O

Oran Company 107
Owens-Corning Fiberglas Corp. ..... *

P

Patterson-Kelley Co., Inc. ..... *
Powder Power Tool Corp. 124
Powers Regulator Co. 11
Production Planning Co. 118
Pyle-National Co. ..... *

R

Revere Copper & Brass Inc. 103
Ric-wiL Company ..... *

S

Sarco Co., Inc. 14
Sarcotherm Controls, Inc. 112
Servel, Inc. 6-7
Skidmore Corporation ..... *
Skinner Electric Valve Div., Skinner Chuck Co. 109
Spence Engineering Co., Inc. 32
Superior Combustion Industries, Inc. *

T

Taylor Forge & Pipe Works ..... *
Thrush, H. A., & Co. 50
Titusville Iron Works Co. Div., Struthers Wells Corp. 113
Trane Co. ..... *
Tube Turns, Inc. ..... *
Tuttle & Bailey, Inc. 47

U

Union Asbestos & Rubber Co. ..... *
United States Steel Corp. ..... *

W

Wagner Electric Corp. ..... *
Want Advertisements 124
Warren Webster & Co. 20-21
Watts Regulator Co. 126
Western Engineering & Mfg. Co..... 122
Westinghouse Electric Corp. 42
Wilson, Grant, Inc. 111
Wing, L. J., Mfg. Co. 33
Worthington Pump & Machinery Corp. 26

Y

Yarnall-Waring Co. 13
York Co. ..... *
Young Radiator Co. ..... *
Youngstown Sheet & Tube Co. 12

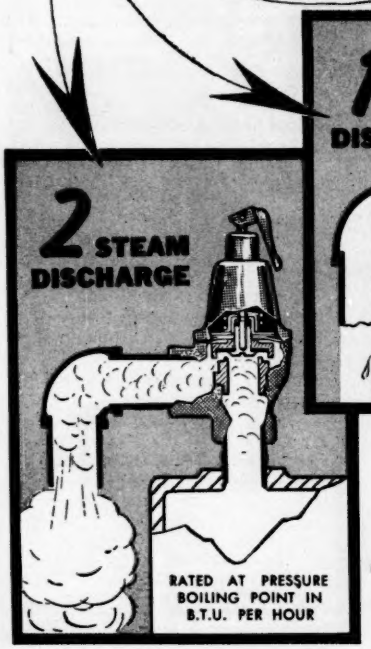
*Advertisement appeared in preceding issue.

A.S.M.E. PROTECTION

IS "PRESSURE" PROTECTION

HERE IT IS IN..
ACTION

WATTS ¾" No. 74



Watts A.S.M.E boiler safety relief valves are rated up to 2,528,100 BTU STEAM discharge capacity at 30 lb. setting by the NATIONAL BOARD OF BOILER and PRESSURE VESSEL INSPECTORS. This provides full pressure protection for practically all hot water space heating installations. A #74 or 174 always reseats perfectly after relieving either water or steam and is ready to protect the boiler again if necessary.

A BOILER IS SAFER WHEN A WATTS No. 74 ..is on the Job

1. When operating conditions cause thermal expansion to create excessive pressure in the system, a #74 or 174 releases just enough water to protect the boiler from excess pressure.

2. Should steam pressure occur in the system—due to a runaway firing condition—these valves pop wide open to release all of the steam that the boiler can generate, thus reducing dangerous pressure to a safer level.

ALWAYS SPECIFY WATTS

WATTS is always making "NEW" and "BETTER THAN EVER" products

WATTS Regulator Company
LAWRENCE, MASSACHUSETTS

MANUFACTURERS OF
PLUMBING and HEATING . . . SAFETY VALVES and CONTROLS

SELECTION OF UNIT HEATERS

The following suggestions for evaluating the performance of suspended propeller type unit heaters are abstracted from a comprehensive discussion by H. E. Smith, Modine Manufacturing Company.

Heat Output

Nominal unit heater Btu per hour capacities are usually based on conditions with 2 pounds steam pressure and with 60F entering air. In the average comfort heating installation, unit heaters are selected whose total capacity in Btu per hour balances the heat loss of the room or building. An exception is made in the case of buildings or rooms heated intermittently; where quick pick-up is important, the total Btu capacity of the unit heaters should exceed the calculated heat loss requirement by from 25 to 50%.

When steam pressure other than 2 pounds is used, or when hot water is the heating medium, the Btu output of the unit will change and must be corrected in accordance with formulae and correction factors published in the manufacturer's catalog.

Air Volume

Air volume (cfm) is possibly the next most important characteristic of a unit heater and yet it is most frequently disregarded in the selection of unit heating equipment. Although the desirable cfm delivery of any given unit can be precisely and easily determined, there is a wide discrepancy in the ratings of many manufacturers' products. It is therefore of the utmost importance that proper air volume be carefully considered by the heating system designer and made a part of the specifications.

With any unit heater, under any given set of operating conditions (steam pressure or water temperature and entering air temperature), an excess of air volume will increase the motor horsepower requirement and electric current costs and will reduce the temperature of the air coming from the heater to a point where the evaporative cooling effect of the moving air stream may be objectionable. In other words, the heated air stream will actually feel uncomfortably cool and drafty to persons in the path of the air stream.

Conversely, when a unit heater does not deliver a sufficient volume of air, the unit can be championed by using a smaller motor but the final air temperature will be increased, making the air uncomfortably warm to persons close to the unit. The heated air will be extremely buoyant, tending to bounce directly to the ceiling, resulting in stratification and wasteful overheating. Furthermore, the heated air stream cannot be projected or thrown a sufficient distance. Many of the inherent advantages of unit heating are thereby lost.

Final Air Temperature

As can be seen from the foregoing statements, the final air temperature of any given unit will vary inversely with the cfm. Since the desirable final air temperature is the same regardless of the size of the unit, it will obviously be easier for the heating system designer to use final air temperature rather than cfm as a yardstick in the selection of unit heaters.

Hundreds of laboratory tests and thousands of actual installations have proven that the final air temperature of any unit heater used for comfort heating should (for the room temperatures normally maintained) be from 80 to 90F higher than the design room temperatures. With room air (entering air) at 60F, the final air temperature should be from 110 to 120F, and with room air at 70F, the final air should be from 120 to 130F. If these figures are used in the selection of unit heaters, the cfm figures will automatically be correct.

The final air temperature of any unit heater will increase drastically with an increase of steam pressure (temperature) or an increase in entering air temperature and vice versa. Therefore, a unit heater having good final air temperature characteristics with steam at 2 lb pressure will deliver heated air at excessively high temperatures if supplied with high pressure steam, while the air would be too cool if hot water at, say, 180F is used as the heating medium. Since the catalog ratings of unit heaters are usually on the basis of 2 lb steam and 60F entering air, it is possible to set up rules of thumb for the simplified selection of unit heaters:

(1) *Low pressure steam (0 to 25 psi).* The final air temperature at 2 lb and 60F should be between 110 and 120F;

(2) *High pressure steam (30 to 125 psi).* The final air temperature at 2 lb and 60F should be from 95 to 105F; and

(3) *Hot water systems (170 to 210F).* The corresponding final air temperature with 2 lb steam and 60F entering air should be from 120 to 145F.

A more specific method of determining proper air volume in cfm in order to select the proper unit heater for a given job is to use the formula:

$$CFM = \frac{460 + E}{576} \times \frac{Btu}{55}$$

where CFM = required volume of air in cubic feet per minute,

E = entering air temperature in degrees (temperature to which room will be heated),

Btu = required Btu per hour output of unit heater at job condition of steam pressure or water temperature and entering air temperature, and

55 = desired temperature rise of heated air above E.

If units are to be selected by the use of this formula, a variation of 10% in cfm is acceptable, because the final air temperature will still be within the desired limits. This formula is exactly correct only for blow-through type units but it can be used with acceptable accuracy for draw-through unit heaters.

Face Air Velocity

Face air velocity usually expressed in feet per minute (fpm), representing the velocity of the heated air at the outlet face of a unit heater is fully as important as cfm and final air temperature in determining the desirable operating characteristics of a unit heater. Fpm may be described as representing the push given to the heated air to obtain the desired heat throw and to prevent stratification by thoroughly mixing the heated air with the room air.

The desirable fpm will not be constant with unit heaters of different sizes and Btu and cfm capacities. Very small unit heaters are used to heat small areas so that the air does not have to be "pushed" as hard as would the air from a large unit used to heat a large space. A too-high velocity from a small unit will probably cause objectionable drafts, while a too-low velocity in a large unit will probably result in failure to blanket the entire area with heated air.

Vertical delivery units have to push the heated air straight down, directly opposite to its natural tendency to rise, and so the velocity (fpm) of a vertical delivery unit logically should be higher than for a horizontal delivery unit. Then, too, higher velocities are more acceptable in verticals than in horizontals because, in low ceilinged rooms, the velocity of the moving air at the breathing line can easily be softened by an efficient air diffuser. Such diffusers are offered by a few manufacturers as standard equipment and by most others as optional extras. Because it is impossible accurately to predict actual job operating conditions, vertical delivery unit heaters should be equipped with efficient, well designed, adjustable air diffusers.

Power Consumption

Shaded pole motors are acceptable and are customarily used only on very small units where power consumption is negligible but they should never be permitted on units requiring 1/20 horsepower or larger motors (units rated at more than 45,000 Btu with 2 lb steam and 60F entering air or units delivering more than 180 equivalent direct radiation or 725 cfm). Split phase, capacitor or polyphase motors should always be used on these larger units because they will require only about half as much electric current as the less efficient shaded pole motors. While these higher quality motors are more expensive, the savings in electricity will, within a year or two, offset their higher cost on any heating job. The engineer should always specify the type of motor to be used.

Noise

Although a certain amount of operating noise is unavoidable in any fan-driven unit heater, it should always be kept to a minimum. On many jobs, such as offices, lobbies, showrooms, most commercial buildings and many light manufacturing buildings, noise is of primary importance in the selection of unit heaters. The sound level must then be kept to the lowest possible peak consistent with proper cfm and fpm.

This will often dictate the investment in a larger number of small units instead of a few large units. It will often also indicate the desirability of using two-speed or variable-speed motors, since they will be less noisy if they can be operated at reduced speeds when maximum heat delivery is not required.

Many manufacturers publish, as catalogued data, the sound ratings of their unit heaters in decibels. These decibel figures can be interpreted by the use of Table 1 in selecting unit heaters for any given job and the allowable decibel rating should be made a part of the specification.

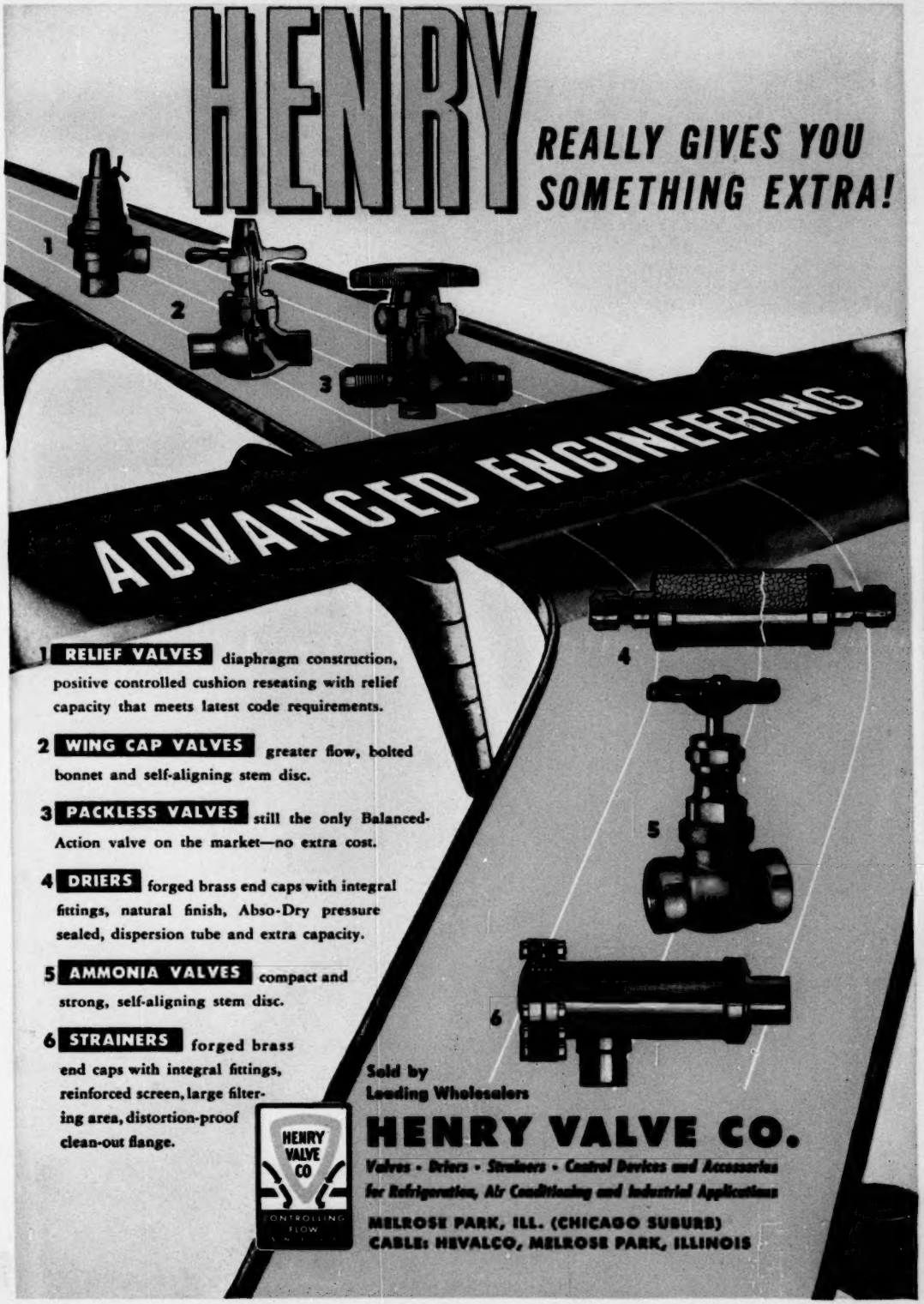
High speed motors (1750 rpm) are usually noisier than low speed (1140 rpm) motors but this is not an iron-clad rule, since fan noise is largely a function of tip speed. In other words, a small diameter fan turned at 1750 rpm need not be noiser than a larger diameter fan turned at 1140 rpm. It is always true, however, that when one basic unit is offered with either 1140 or 1750 rpm motor (typical of many manufacturers), then the unit was designed for reasonably quiet operation at the lower speed and will be noisy at 1750 rpm. A safe rule to follow is: "The fan speed of unit heaters larger than 200 equivalent direct radiation should never exceed 1140 rpm."

Table 1 – Permissible Noise Levels in Various Room and Building Types

Type of Building or Room	Permissible Sound Level (decibels)
Apartments, classrooms, courtrooms, executive offices, hospitals, libraries, museums, residences	25 – 40
General offices, hotel dining rooms, recreation rooms, showrooms, small stores, tea rooms, upper floors of department stores	41 – 50
Bank lobbies, cafeterias, drug stores, general offices, grocery stores, main floors of department stores, public buildings, post offices, restaurants, service stations	51 – 60
Factories, foundries, garages, machine shops, office machinery rooms, packing plants, shipping platforms, steel mills	61 – 75
Boiler works, forge shops, roundhouses, steel fabricating shops	76 – 90

HENRY

REALLY GIVES YOU SOMETHING EXTRA!



1 **RELIEF VALVES** diaphragm construction, positive controlled cushion reseating with relief capacity that meets latest code requirements.

2 **WING CAP VALVES** greater flow, bolted bonnet and self-aligning stem disc.

3 **PACKLESS VALVES** still the only Balanced-Action valve on the market—no extra cost.

4 **DRIERS** forged brass end caps with integral fittings, natural finish, Abso-Dry pressure sealed, dispersion tube and extra capacity.

5 **AMMONIA VALVES** compact and strong, self-aligning stem disc.

6 **STRAINERS** forged brass end caps with integral fittings, reinforced screen, large filtering area, distortion-proof clean-out flange.

HENRY VALVE CO CONTROLLING FLOW

Sold by Leading Wholesalers

HENRY VALVE CO.

Valves • Driers • Strainers • Control Devices and Accessories for Refrigeration, Air Conditioning and Industrial Applications

MELROSE PARK, ILL. (CHICAGO SUBURB)
CABLE: HEVALCO, MELROSE PARK, ILLINOIS

a full line of McDONNELL

One of the worthiest jobs for every heating man is to put every domestic hot water heater and tank on a *SAFE* operating basis . . . and it also happens to be a highly profitable job. The best way to do this at a moderate cost is illustrated and explained here . . . but first consider the background of this development:

As every heating man knows, every hot water storage tank down to the smallest domestic heater is a pressure vessel designed for some predetermined working pressure that should *never* be exceeded. This too-often neglected fact was fully recognized several years ago by an engineering committee of the National Bureau of Casualty & Surety Underwriters who did a large amount of research work on the protection of heaters and tanks.

Their work, later confirmed by an All-industry group, showed that keeping tank pressure within safe limits is fully accomplished when the pressure relief valve has *sufficient capacity to dissipate the maximum heat output of the tank*. This finding is covered by the recommended testing procedure outlined in the A.S.M.E. boiler code. In substance, the A.S.M.E. code recommends that *every* hot water heater shall be equipped with a relief valve having tested, rated, and certified capacity to dissipate the gross heat output of the heater or tank. That's putting it down strong . . . as well it should be.

The McDonnell Safety Relief Valves announced here meet this recommendation to the letter. They are tested and certified as provided in the code and carry on their nameplates the official A.S.M.E. symbol of compliance along with the certified ratings in Btu.'s per hour. The accompanying table covers opening pressures and certified ratings. Note that the final numbers show the opening pressures (3345 opens at 45 lbs., 3375 opens at 75 lbs., and so on). This means that you can equip any tank or heater in your territory with a valve matched to its Btu. output, thus giving the owner protection from overpressure.

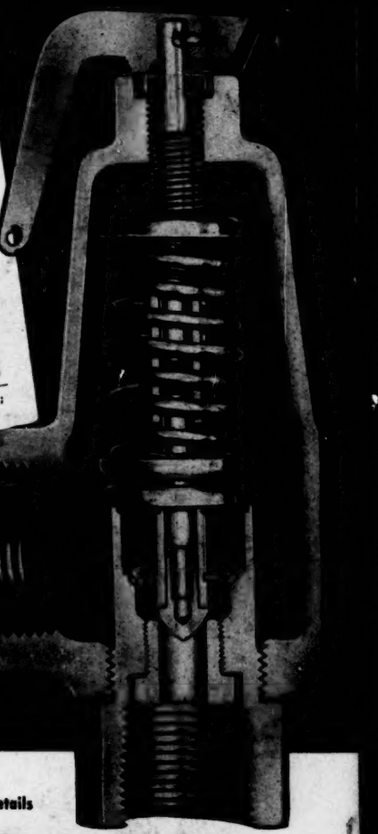
Cost is low—Every domestic tank and heater needs this protection, but until this series of valves was developed the added cost of Btu.-rated valves has been a barrier to their universal use. Now that barrier is completely broken down by the development of a valve of such ingenious simplicity that it costs little if any more than valves of unrated capacity and questionable dependability. Note the facts about the design and operation of these valves.

McDONNELL & MILLER, INC.
3500 N. Spaulding Avenue • Chicago 18, Illinois
Doing One Thing Well

The cut shows actual size of the No. 33 series for domestic hot water service. Every valve is tested, certified and A.S.M.E. labeled. Valve needle is stainless steel, hardened and precision ground to polished finish. Seat is also stainless, machined to exacting tolerance. Testing lever is remarkably easy to lift and functions independently of valve stem—an exclusive feature. Note exclusive hydra-lift principle, explained below, which distinguishes it from all other valves. Sizes and ratings are:

Valve No.	Opening Pressure	Certified Capacity in Btu. per hr.
3345	45 lbs.	321,300
3375	75 lbs.	368,700
33100	100 lbs.	423,900
33125	125 lbs.	513,900
33150	150 lbs.	605,700

Inlet size of all valves, 3/4"; outlet size, 1".



Ask for catalog sheet giving complete details

McDONNELL *Safety Relief Valves*

The nameplate tells the whole story—

Each McDonnell Safety Relief Valve has this plate showing capacity in Btu. per hour as certified by National Board; also A.S.M.E. Code Symbols, size, and opening pressures. You can be sure it is properly matched to the tank or heater.